DL.2 Digital Light
User Manual

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HIGH END SYSTEMS

DL.2 User Manual
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Declaration of Conformity

according to ISO/IEC Guide 22 and EN45104

Manufacturer's name: High End Systems, Inc.

Distributor's name: High End Systems, Inc.
Distributor's address: 2105 Gracy Farms Lane
Austin, Texas 78758 USA

Declares that the product

Product Name: DL.2
Product Number: All
Product Options: All

conforms to the following EEC directives:

73/23/EEC, as amended by 93/68/EEC

89/336/EEC, as amended by 92/31/EEC and 93/68/EEC

Equipment referred to in this declaration of conformity was first manufactured in compliance with the following standards in 2005:

Safety: EN 60598-1: 1997
EN 60598-2-17; 1990
A1-A3: 1998
A13: 1999

EMC:

EN 55022

Conducted Emissions	Class A
Radiated Emissions	Class A
ANSI C63.4	Class A
FCC 47 CFR Part 15	Class A
VCCI V-1/2001.04	Class A

EN 55024

EN 61000-4-2	4/8kV
EN 61000-4-3 A1	3V/m
EN 61000-4-4	1kV/0.5kV
EN 61000-4-5	2kV/1kV
EN 61000-4-6	3 Vrms
EN 61000-4-11	>95%-0.5p, 30%-25p,>95%-250p

EN 61000-3-2 Class A
EN 61000-3-3

USA, Friday, July 28, 2006
Kenneth Stuart Hansen, Compliance Engineer

Product Modification Warning

High End Systems products are designed and manufactured to meet the requirements of United States and International safety regulations. Modifications to the product could affect safety and render the product non-compliant to relevant safety standards.

Mise En Garde Contre La Modification Du Produit

Les produits High End Systems sont conçus et fabriqués conformément aux exigences des règlements internationaux de sécurité. Toute modification du produit peut entraîner sa non conformité aux normes de sécurité en vigueur.

Produktmodifikationswarnung

Design und Herstellung von High End Systems entsprechen den Anforderungen der U.S. Amerikanischen und internationalen Sicherheitsvorschriften. Abänderungen dieses Produktes können dessen Sicherheit beeinträchtigen und unter Umständen gegen die diesbezüglichen Sicherheitsnormen verstoßen.

Avvertenza Sulla Modifica Del Prodotto

I prodotti di High End Systems sono stati progettati e fabbricati per soddisfare i requisiti delle normative di sicurezza statunitensi ed internazionali. Qualsiasi modifica al prodotto potrebbe pregiudicare la sicurezza e rendere il prodotto non conforme agli standard di sicurezza pertinenti.

Advertencia De Modificación Del Producto

Los productos de High End Systems están diseñados y fabricados para cumplir los requisitos de las reglamentaciones de seguridad de los Estados Unidos e internacionales. Las modificaciones al producto podrían afectar la seguridad y dejar al producto fuera de conformidad con las normas de seguridad relevantes.

FCC Information

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

Important Safety Information

Instructions pertaining to continued protection against fire, electric shock, and injury to persons are found in Appendix E. Please read all instructions prior to assembling, mounting, and operating this equipment.

Important: Informations De Sécurité

Les instructions se rapportant à la protection permanente contre les incendies, l'électrocution, excessif et aux blessures corporelles se trouvent dans l'Annexe E. Veuillez lire toutes les instructions avant d'assembler, de monter ou d'utiliser cet équipement.

Wichtige Sicherheitshinweise

Sicherheitsanleitungen zum Schutz gegen Feuer, elektrischen Schlag, und Verletzung von Personen finden Sie in Anhang E. Vor der Montage, dem Zusammenbau und der Intbetriebnahme dieses Geräts alle Anleitungen sorgfältig durchlesen.

Informazioni Importanti Di Sicurezza

Le istruzioni sulla protezione da incendi, folgorazione, e infortuni sono contenute nell'appendice E. Si prega di leggere tutte le istruzioni prima di assemblare, montare e azionare l'apparecchiatura.

Informacion Importante De Seguridad

En el Apéndice E se encuentran instrucciones sobre protección continua contra incendios, descarga eléctrica, y lesiones personales. Lea, por favor, todas las instrucciones antes del ensamblaje, montaje y operación de este equipo.

Symbols

The following international caution and warning symbols appear in margins throughout this manual to highlight messages.

CAUTION: This symbol appears adjacent to Caution messages. Not heeding these messages could result in personal injury and/or damage to equipment.

WARNING: This symbol appears adjacent to high voltage warning messages. Not heeding these messages could result in serious personal injury.

This symbol indicates the minimum focus distance from a combustible object.

This symbol cautions against mounting the fixture on a flammable surface.

This symbol indicates that, while operating, equipment surfaces may reach very high temperatures. Allow the fixture to cool before handling.

Fog Machine Warning

Like all high quality video projection units, the DL.2 fixture must be kept protected from excessive amounts of glycol fog, mineral oil, and smoke. The DL.2 fixture incorporates two-stage air filtering to reduce these risks to a minimum; however, the user must follow these guidelines to ensure continued operation of the fixture:

- Air filters (both fixture and projector) should be checked and cleaned on a regular basis. When used in a closed or fixed environment where fog or haze is used, we recommend at least a weekly check.
- Do not situate DL.2 fixtures in areas of high fog density such as directly in front of a fog machine or mineral oil hazer.
- Minimize the exposure of DL.2 fixtures to both glycol fog and mineral oil.

The DL.2 fixture is a highly complex and sensitive electro-optical device and care and thought in how it is used, rigged, and positioned will maximize the product's life and your investment.

Failure to follow these guidelines and carry out regular maintenance will void the warranty.

Packaged Media Notice:

Any use of this product other than consumer personal use in any manner that complies with the MPEG-2 Standard for encoding video information for packaged media is expressly prohibited without a license under applicable patents in the MPEG-2 patent portfolio, which license is available from MPEG LA, L.L.C., 250 Steele Street, Suite 300, Denver Colorado 80206.

Warranty Information

Limited Warranty

Unless otherwise stated, your *product (excluding the lamp)* is covered by a one year parts and labor limited warranty. The lamp warranty for Christie projectors is 120 days or 500 hours whatever comes first. It is the owner's responsibility to furnish receipts or invoices for verification of purchase, date, and dealer or distributor. If purchase date cannot be provided, date of manufacture will be used to determine warranty period.

Returning an Item Under Warranty for Repair

It is necessary to obtain a Return Material Authorization (RMA) number from your dealer or point of purchase BEFORE any units are returned for repair. The manufacturer will make the final determination as to whether or not the unit is covered by warranty.

Any Product unit or parts returned to High End Systems must be packaged in a suitable manner to ensure the protection of such Product unit or parts, and such package shall be clearly and prominently marked to indicate that the package contains returned Product units or parts and with an RMA number. Accompany all returned Product units or parts with a written explanation of the alleged problem or malfunction. Ship returned Product units or parts to: 2105 Gracy Farms Lane, Austin, TX 78758 USA.

Note: Freight Damage Claims are invalid for fixtures shipped in non-factory boxes and packing materials.

Freight

All shipping will be paid by the purchaser. Items under warranty shall have return shipping paid by the manufacturer only in the Continental United States. Under no circumstances will freight collect shipments be accepted. Prepaid shipping does not include rush expediting such as air freight. Air freight can be sent customer collect in the continental United States.

REPAIR OR REPLACEMENT AS PROVIDED FOR UNDER THIS WARRANTY IS THE EXCLUSIVE REMEDY OF THE CONSUMER OTHER THAN THE LIMITED WARRANTY STATED ABOVE. HIGH END SYSTEMS, INC. MAKES NO WARRANTIES, EXPRESS OR IMPLIED, WITH RESPECT TO ANY PRODUCT, AND HIGH END SPECIFICALLY DISCLAIMS ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. HIGH END SHALL NOT BE LIABLE FOR ANY INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGE, INCLUDING LOST PROFITS, SUSTAINED OR INCURRED IN CONNECTION WITH ANY PRODUCT OR CAUSED BY PRODUCT DEFECTS OR THE PARTIAL OR TOTAL FAILURE OF ANY PRODUCT REGARDLESS OF THE FORM OF ACTION, WHETHER IN CONTRACT, TORT (INCLUDING NEGLIGENCE), STRICT LIABILITY OR OTHERWISE, AND WHETHER OR NOT SUCH DAMAGE WAS FORESEEN OR UNFORESEEN.

Warranty is void if the product is misused, damaged, modified in any way, or for unauthorized repairs or parts. This warranty gives you specific legal rights, and you may also have other rights specific to your locality.

Patents

This product is protected by one or more patents including: US 4,392,187; US 4,602,321; US 4,688,161; US 4,701,833; US 4,709,311; US 4,779,176; US 4,800,474; US 4,962,687; US 4,972,306; US 4,980,806; US 5,010,459; US 5,031,078; US 5,073,847; US 5,078,039; US 5,186,536; US 5,209,560; US 5,278,742; US 5,282,121; US5,307,295; US 5,329,431; US 5,331,822; US 5,367,444; US 5,402,326;US 5,430,629; US 5,432,691; US 5,454,477; US 5,455,748; US 5,506,762; US 5,515,254; US 5,537,303; US5,545,951; US 5,580,164; US 5,590,954; US 5,590,955; US 5,640,061; US 5,647,662; US5,665,305; US 5,691,886; US 5,728,994; US 5,758,955; US 5,758,956; US 5,769,527; US5,774,273; US 5,798,619; US 5,806,951; US 5,823,661; US 5,825,548; US5,828,485; US 5,829,868; US 5,857,768; US 5,882,107; US 5,934,794; US 5,940,204; US 5,945,786; US5,953,152; US 5,980,066; US 6,048,080; US 6,327,103; US 6,048,081; US 6,057,958; US6,054,816; US 6,126,288; US 6,142,652; US 6,172,822; US 6,188,933;US 6,208,087; US 6,219,093; US 6,220,730; US 6,241,366; US 6,255,787; US 6,256,136; US 6,278,542; US6,288,828; US 6,327,103; US 6,421,165; US 6,430,934; US 6,466,357; US 6,502,961; USD347,113; US D350,408; US D359,574; US D360,404; US D365,165; US D366,712; US D370,080; US D372,550; US D377,338; US D381,740; US D409,771; US 6693392; US 6719433; EP 0662275; EP 0767398; DE 621495; DE 655144; DE 797503; EP 0475082; GB 2 043 769 B; GB 2 055 842 B; GB 2 283 808 B; GB 2 290 134 B; GB 2 291 814 B; GB 2 292 530 B; GB 2 292 896 B; GB 2 294 909 B; GB 2 295 058 B; GB 2 303 203 B; GB 2 306 887 B; GB 2 307 036 B; GB 2 316 477 B; MR0862-1996; M9,604,224.9.

What You Should Know About Copyright

The following FAQ can help you understand copyright laws and how they apply to content used with the DL.2 fixture

By *Suzy Vaughan Associates* for High End Systems.

I want to use a film clip from "When Harry Met Sally" in a promotional piece advertising my services. What do I have to do to be able to do that?

First of all, you need to obtain permission to use the clip from its owners. The clip is considered intellectual property, just as though it were your car or some software code developed by and belonging to Microsoft. This is because the U.S. Copyright Act gave creators of literary works (which include books, films, television programs, art works, still photos and musical compositions and recordings) the right to sell or license these works and to make money from them for the period of the copyright.

But what about public domain material? I heard that lots of material is in the public domain and can be used for free.

Once the copyright runs out, the creative work falls into the public domain and can be used freely by anyone without payment or licensing. If the work is not public domain, it is considered literary property. The Copyright Act provides substantial penalties for copyright infringement ranging from $10,000 for accidental infringement to $250,000 for willful infringement. However, contrary to popular belief, there really is not that much material in the public domain so this approach will limit you creatively.

What if I want to use a clip in a public performance? It's not being filmed or taped. Surely I don't need permission for that?

Public gatherings require clearance whenever copyrighted data is projected to audiences, or for any use other than just personal viewing. Concerts, trade shows, industrial shows, parties and raves are all examples of public performance and permission must be obtained.

Suppose I want to use a still photo or a magazine cover or a television clip? Do I have to obtain permission for them too?

Yes, they are also copyrighted works, whose owners must grant a license for their usage.

Do I need any other permissions to use this material?

In many cases you do. You may need to obtain permission to use the appearance of actors who appear in the clip as well as pay the writers and directors of the film that your clip comes from.

What about music? I hear you can use 8 bars for free.

8 bars for free is a fallacy that has been passed around as a fact for a long period of time. However, it isn't true. Both musical compositions and records require licensing and payment.

What about High End Systems material included with the DL.2 fixture? Do I have to clear that?

No. High End Systems has worked to provide clearance for the content that is provided with the DL.2 fixture. Any materials you received directly from HES with the purchase of a new DL.2 fixture have already been properly licensed for your use in shows and presentations. That does not, however, license you to sell this content separately from DL.2 fixture. Also, please be sure that any new content you obtain from outside sources is properly cleared for public presentation.

This sounds really difficult and I don't know how to do it? What do I do to properly license copyrighted material?

You need to consult with a Content Clearing House or with a properly licensed Intellectual Property Attorney. Content clearinghouses are typically less expensive to work with and have well established industry relations that can result in cost savings. High End Systems uses and highly recommends Suzy Vaughan Associates. Suzy Vaughan Associates has 20 years of experience in clearing clips, talent, and music for use in any number of venues. Their clients include Barbara Streisand, Michael Jackson, and The Emmys among other shows.

You can obtain more information about Suzy Vaughan Associates' services by calling 818-988-5599 or emailing info@suzyvaughan.com. Their website is www.suzyvaughan.com. Suzy Vaughan is also an attorney specializing in intellectual property issues.

How much does it typically cost to license copyrighted material?

The answer depends entirely on what material you want to use and how you plan to use it. Prices can range from hundreds of dollars for photography content to thousands of dollars for a highly desirable film/video clip. Since price is content-sensitive, the best thing to do is to contact a clearinghouse like Suzy Vaughan Associates and let them find out for you.

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Chapter I:

Product Overview

This chapter describes the features and specifications of the DL.2 fixture and the Content Management Application software.

The DL.2 (Digital Light 2) fixture merges video projection and automated lighting technologies with a DMX controllable digital media server housed in a moving yoke fixture. The built-in 32-bit **Graphics Engine** utilizes Windows XP Embedded and DirectX application programming interface to provide extensive image control of up to three 3-D graphic objects.

DL.2 fixtures use DMX512 protocol to control hardware functions like pan, tilt, and zoom, as well as media control functions including loading images and movies and mapping them onto 3-D graphical objects. The internal graphics engine lets you manipulate position, scale, rotation, apply visual effects and color mix each graphic object. You can create and control up to three of these objects and then apply global effects to the composite image.

The DL.2 fixture provides a fully equipped internal digital camera and IR illuminator to input live video to its own graphic engine or to another DL.2 fixture or device. While combining camera and light from the same source to allow a unique point of view, the camera also features optical and digital zoom, frame rate and invert effects as well as freeze frame, color negative and grayscale conversion effects. The ability to point the camera at it's own projection combined with adjustable zoom creates unique realtime video feedback and "hall of mirrors" effects. The IR illuminator allows visibility, focusing, and fading in blackout situations.

The **Content Management Application** (CMA) runs on your workstation or laptop computer and communicates with DL.2 fixtures over an Ethernet network. The CMA lets you remotely upload, move and clone content files, configure fixtures, and upgrade software.

Features

System

- DL.2 software based on Windows XP Embedded and DirectX technology
- Powerful Content Management and Configuration software can remotely manage multiple DL.2 fixtures
- Integrated Sony camera with Super HAD technology and infrared illuminator provides live video input and output from fixture location
- Supports importing of custom content including: 3D objects, media files, still images
- DMX512 and Art-Net support
- Remote software upgrade capability
- Royalty-free stock digital art collection features over 1000 lighting-optimized files
- RGBHV and S-Video connections accept a wide range of media device inputs

Graphics Engine

- Simultaneous playback of three discrete media streams on separate 2D/3D objects
- Image Optimizing Controls let you adjust both Black Level and Contrast for each cue and for each image
- 30 Object parameters give you graphic controls for each individual media stream including:
  - A choice of multiple play modes and play speeds
  - The ability to define any segment of a video loop including Scrub capability
  - Multiple color mixing and visual effects that can be combined any way you choose
  - Variable Opacity to allow for crossfading or dissolves between media streams
  - Full control of image Rotation, Positioning and Scaling on X, Y and Z axes
  - Visual Modes that let you control black level and contrast to optimize content
  - Video input or camera capture you can apply to 2d/3d objects
- 35 Global parameters provide graphic controls to the composite image created by up to 3 media streams
  - Collage Generator combines output of the same file from multiple DL.2 fixtures into a smooth panorama array.
  - Intensity overlays the opacity control to provide system-wide intensity level
  - Overall image Color Mixing applied to composite media stream image
  - Color Effects including edge colors allow for combined image color mixing
  - Multiple Mask selections with edge fading and strobe effects
  - Edge fading for creating montages
  - Keystone correction on output projection
  - Viewpoint controls provide ability to change viewing angle/perspective on images
- Multiple modes for synchronizing all networked DL.2 fixtures.

Content Management Application

- Available for Windows and Mac operating systems
- Communicates with DL.2 fixtures over an Ethernet network
- Uploads and downloads custom digital content to DL.2 fixtures
- Configures DL.2 fixtures with remote control of all menu commands
- Updates software including content, applications, and operating system to DL.2 fixtures.

Hardware

- 17 Motion Parameters for mechanical fixture control include:
  - Mechanical Iris adjustment to full black-out
  - 400-degree Pan and 240-degree Tilt movement
  - DMX control of projector zoom and focus
  - DMX control of camera functions
- Integrated digital camera feeds digital video capture directly into the graphic engine that provides:
  - Optical + digital zoom to increase image up to 216×
  - Options for 1-30 frame captures / sec
  - Vertical and/or Horizontal image inversion

  - Black and White, Color Negative and Freeze Frame effects
  - White Balance including Red and Blue gain control
- Infrared illuminator allows video capture even in blackout settings
- Remote video input and output switching let you select live video from external source including another DL.2 fixture's camera feed.
- Full color display and menu functions
- Powered by a 3.2GHZ Pentium 4 HT processor with an ATI X850XT Graphics Processor
- Gigabit Ethernet for fast content uploading and multiple fixture synchronization
- Mounting system provides multiple orientation options

Related Products and Optional Accessories

The following table lists related products and accessories available for the DL.2 fixture. For more information, contact your High End Systems dealer/distributor (see *Contacting High End Systems®* on page ii.)

Part Description	Part Number
Replacement lamp	55030070
Replacement Filter, fixture head	80260014
Replacement Filter, Projector Lamp Small	80260018
Replacement Filter, Projector Lamp Large	80260017
5-amp, slow-blow fuse	90403012
Front window	80530074
Wholehog 3 lighting console	61020001
Hog iPC lighting console	74020001
Galvanized safety cable	12040001
Mega-Claw clamp	67040007
Male 5-pin DMX terminator	90404039
Heavy duty 5-pin XLR cable (10')	55050017
Heavy duty 5-pin XLR cable (25')	55050018
Heavy duty 5-pin XLR cable (50')	55050019
Heavy duty 5-pin XLR cable (100')	55050020

Chapter 2:

Setup and Configuration

Hardware setup includes mounting, connecting to power and Ethernet and DMX linking. Software setup includes launching the Content Management Application (CMA) and configuration options.

Hardware Setup

Unpacking the Fixture

Your DL.2 fixture ships in a road case specifically designed to protect the product during transport. When unpacking, inspect both the outside of the fixture and the projector for physical damage to components.

Your DL.2 fixture ships with the following:

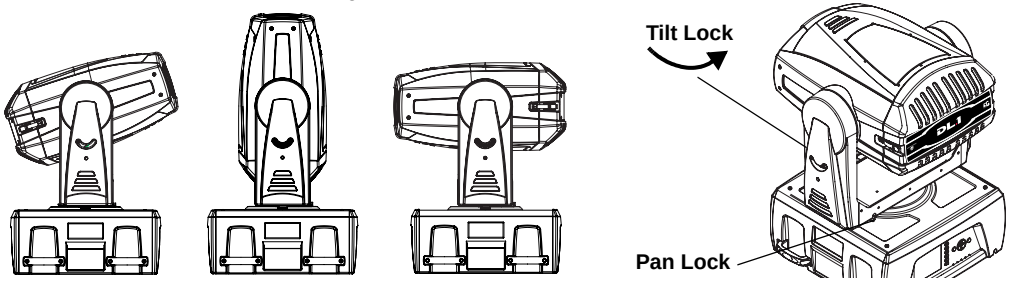
- One DL.2 fixture in road case
- Two mounting brackets
- One safety cable
- Documentation CD that contains
  - — CMA application
  - — User Manual in .pdf format
  - — Fixture software
  - — Recovery software image

High End Systems® assumes no responsibility for products that are damaged during transport. Return a product for repair in its road case.

Before sending anything to the factory, call your High End Systems dealer/distributor for a Return Material Authorization (RMA) number. The factory cannot accept any goods shipped without an RMA number.

Pan and Tilt Locking

The DL.2 fixture ships with pan and tilt latches locked. You can unlock/adjust these latches to stabilize the fixture for mounting.



Attaching a Power Cord Cap

The DL.2 fixture ships with an SJT power cord. Use the information in this section to replace the power cord cap for locations with another electrical standard.

Different locations (even within the same country) may require a different power cord cap to connect the fixture to a power outlet. Because of the variety of power cord caps used worldwide, High End Systems, Inc. cannot make specific recommendations for the power cord cap. Contact a local authority for the type of power cord cap needed. When installing the power cord cap, note that the cores in the mains lead are colored according to the following code:

- green and yellow = earth
- blue = neutral
- brown = live

Installing a Line Cord Cap - U.K. Only

In the United Kingdom, the colours of the cores in the mains lead of this equipment may not correspond with the colored markings identifying the terminals in the fixture's plug. Therefore, install a line cord cap in accordance with the following code:

- The core which is coloured green and yellow must be connected to the plug terminal which is marked with the letter "E," or by the earth symbol ⏚, or coloured green, or green and yellow.
- The core which is coloured blue must be connected to the terminal which is marked with the letter "N" or coloured black.
- The core which is coloured brown must be connected to the terminal which is marked with the letter "L" or coloured red.

WARNING:
Class 1 equipment - This equipment must be earthed.

Vatic Fitter Heads Information - Danmark

Advarsel: Beskyttelse mod elektrisk chock.

Vigtigt!

Lederne med gul/groen isolation maa kun tilsluttes en klemme maerket eller

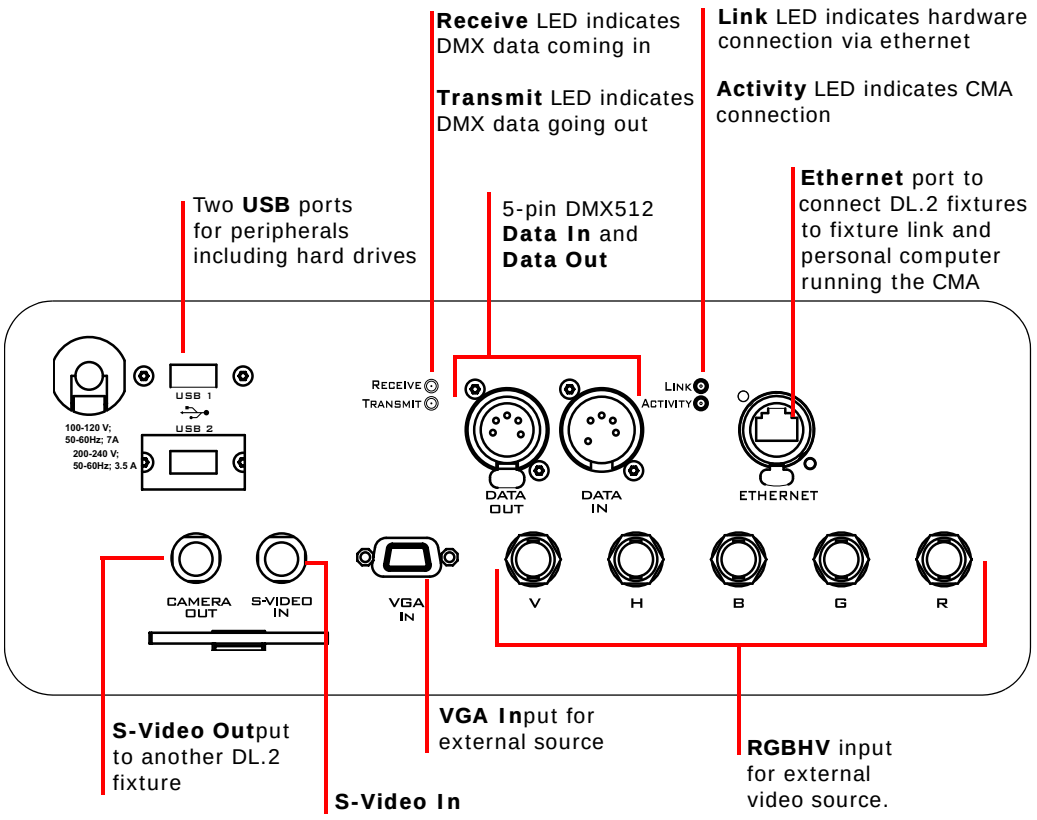
Back Panel Connections

The DL.2 fixture's back panel provides ports for:

- **5-pin DMX Data In and Data Out** (see *Setting up a Standard DMX Link* on page 10 for more information)
- **Ethernet** to connect to other DL.2 fixtures and your computer running the Content Management Application (CMA) software on a fixture link (see *Setting up an Ethernet Fixture Link* on page 11).
- Two **USB** ports for connecting peripheral drives to assist with troubleshooting

- **RGBHV, VGA** and **S-Video** In options for video input.
- **Camera Out** provides S-Video output from the internal camera to another DL.2 fixture or other external video output device.

CAUTION:
To avoid damaging the fixture and voiding the warranty, do not physically connect to the RGBHV and VGA inputs at the same time.



Mounting the Fixture

You can mount DL.2 fixtures suspended from a support system (such as a truss) or freestanding on its base.

WARNING!
Equipment suitable for dry locations only. Do not expose this equipment to rain or moisture.

CAUTION!
Always use a secondary safety cable when mounting this fixture.

Maintain a minimum focus distance of 1.4 meters from a combustible object.

Do not mount on a flammable surface.

Note: Due to the wide variety of possible lighting designs, High End Systems cannot make specific mounting recommendations. Consider the following procedure as a suggested guideline only.

Fog Machine Warning

Like all high quality video projection units, the DL.2 fixture must be kept protected from excessive amounts of glycol fog, mineral oil, and smoke. DL.2 incorporates a two-stage air filtering system with additional washable prefilters in the head and base housing to reduce these risks to a minimum. However, you must follow these guidelines to ensure continued operation of the fixture:

- Air filters (both fixture and projector) should be checked and cleaned on a regular basis. When used in a closed or fixed environment where fog or haze is used, we recommend at least a weekly check.
- Do not situate DL.2 in areas of high fog density such as directly in front of a fog machine or mineral oil hazer.
- Minimize the exposure of DL.2 to both glycol fog and mineral oil.

DL.2 is a highly complex and sensitive electro-optical device and care and thought in how it is used, rigged, and positioned will maximize the product's life and your investment.

Note: Failure to follow these guidelines and carry out regular maintenance will void the warranty.

Mounting the Fixture Upright

CAUTION!
Do not mount the fixture upright without the four rubber feet attached.

To mount the fixture upright, place the fixture on a sturdy, stable surface that will support more than the 53.5 kg (118 lb) weight of the DL.2 fixture. If the surface is above floor height, use safety cables to secure the fixture to the surface.

Truss Mounting

When mounting the fixture on a truss or another type of support:

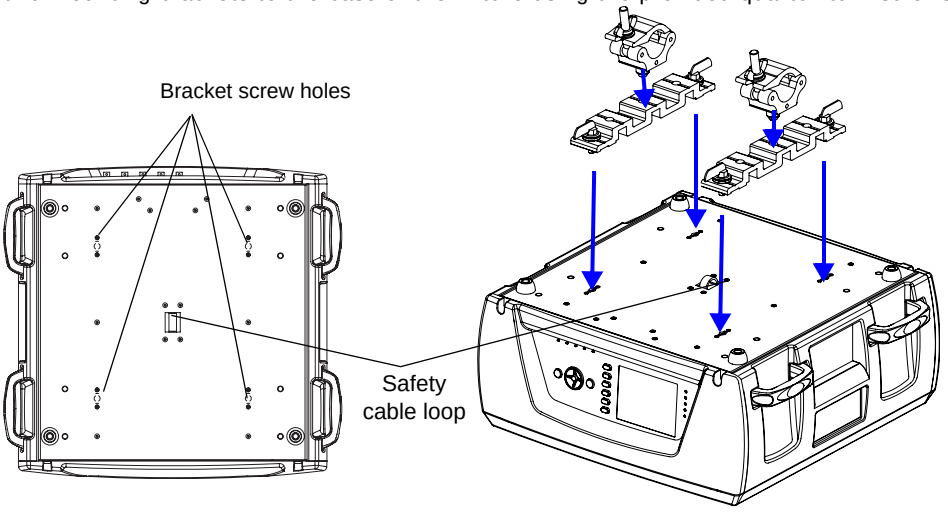
- Verify the truss or support will handle the combined weight of all the devices on the truss.
- Always mount the DL.2 fixture with the mounting bracket assembly that shipped with your fixture and a safety cable attached (using the mounting bracket) to the fixture's base.

WARNING!
Before mounting, disconnect power to the fixture. If it has been operating, allow the fixture to cool for five minutes before handling.

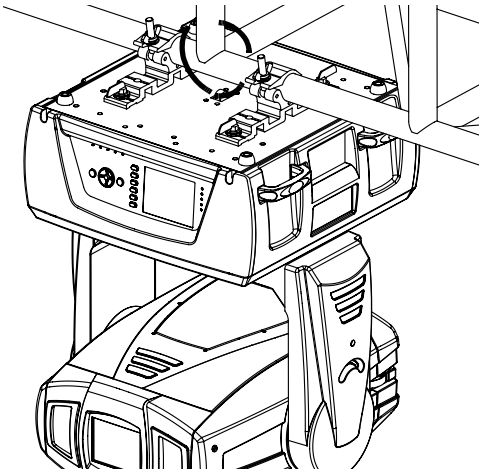
CAUTION!
Do not use C- Clamps to mount the DL.2 fixture to truss.

Use the following steps to mount a DL.2 fixture on a standard truss:

1. Due to it's size and weight, at least two people should support the fixture while another attaches clamps and safety cables. Always stand on a firm, stable surface when mounting a fixture to its support.
2. Mount the clamps that shipped with fixture to the mounting brackets and then attach the two mounting brackets to the base of the fixture using the provided quarter-turn screws.



3. Tighten the clamps firmly to the fixture's base and to the support.
4. Run the safety cable through the loop on the fixture's base, and around the truss.



Note: ***High End Systems does not recommend operation of the DL.2 fixture with the base perpendicular to the stage floor (fixture mounted sideways). Sideways mounting will result in significantly decreased lamp life.***

Linking DL.2 Fixtures

DL.2 fixtures can be linked with other fixtures on a standard DMX512 link using XLR cabling and then controlled by a DMX desk. The number of fixtures on a link will be determined by the combined number of channels required by all the fixtures. The DMX channel range of a DL.2 fixture is determined by the protocol mode you choose.

- Standard Protocol = 170 channels
- Dual Protocol = 132 channels
- Single Protocol = 94 channels

Use data-grade cable and 5-pin XLR cable connectors. Data-grade cable is designed to carry a high-quality signal with less susceptibility to electromagnetic interference and less degradation over long distances. For cable and connector specification, see *Cable and Connector Specifications* on page 257.

Test each cable with a voltage/ohm meter (VOM) to verify correct polarity and to make sure that the negative and positive pins are not grounded or shorted to the shield or to each other.

CAUTION!
Do not connect anything to the ground lug on the XLR connectors.
Do not connect or allow contact between the common (cable shield) and the fixture's chassis ground. Grounding the common could cause a ground loop and/or erratic behavior.

Setting up a Standard DMX Link

To link one or more fixtures to a DMX controller:

1. Connect the male XLR connector of a DMX Data cable to the controller's DMX Data Out connector.
2. Connect the Data cable's female XLR connector to the Data In connector of the first (or next) fixture on the DMX link.
3. Continue linking the remaining fixtures connecting a cable from the Data Out connector of each fixture to the Data In connector of the next fixture on the link.

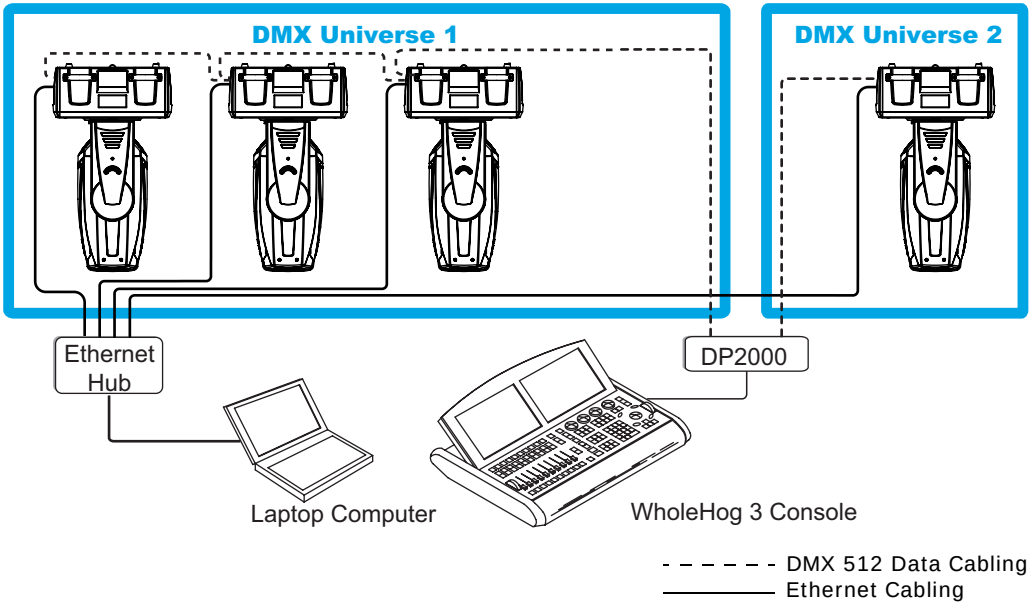
Connect a male terminator to the Data Out connector of the last fixture in the link (see *Powering On the Fixture* on page 12). For information on obtaining a terminator, see *Related Products and Optional Accessories* on page 3. You can construct a terminator according to the specifications listed in *Cable and Connector Specifications* on page 235.

Setting up an Ethernet Fixture Link

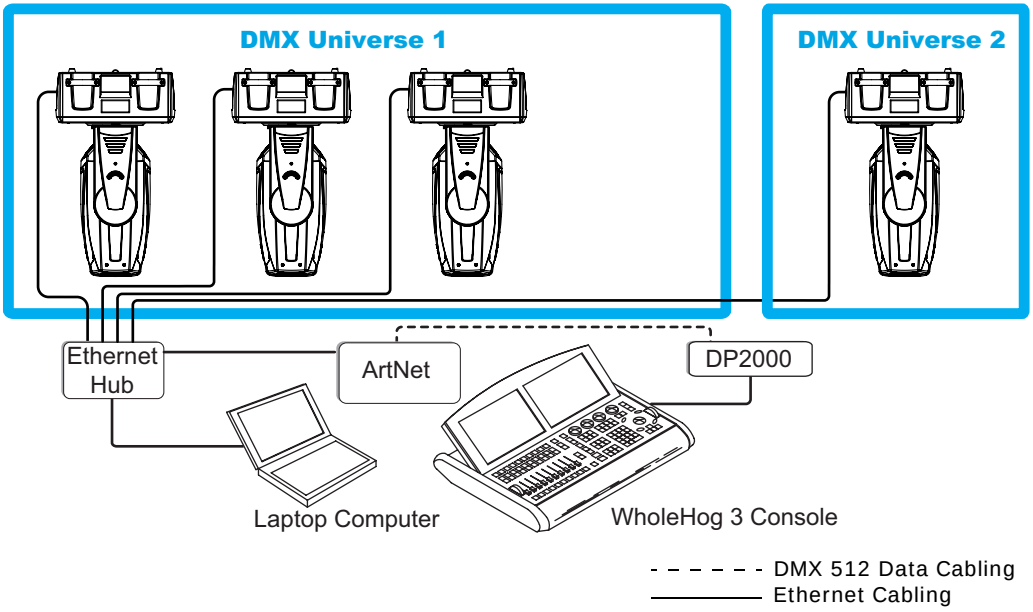
DL.2 fixtures utilize an Ethernet network to synchronize playback and access the CMA software for remote content management and fixture configuration. If you are using a DMX console and other automated lighting products compatible with ethernet, this network can also serve as the link for DMX control.

Linking Configurations

The following diagrams show configuration options for linking DL.2 fixtures to each other via ethernet for accessing the Content Management Application running on your computer and to the DMX512 link for DMX desk control.



Configuration Option 1



Configuration Option 2

Powering On the Fixture

WARNING:
This equipment is designed for connection to a branch circuit having a maximum overload protection of 20 A.

CAUTION:
Do not power on the fixture until *verifying* that the line cord cap is suitable for the power source in your location. For more information, see *Attaching a Power Cord Cap* on page 6.

To power on the DL.2 fixture, simply connect it to an appropriately-rated power source. It is very important that you shutdown and disconnect power to the fixture before performing certain procedures discussed in this manual.

Homing the Fixture

When the DL.2 fixture is connected to an appropriately-rated power source, it automatically begins a homing procedure to verify that the major functions of the fixture and its internal projector are oriented properly.

Shortcut: ***Holding down the inner most (i.e. middle) two menu tab buttons for more than two seconds will home the unit.***

Viewing the Display Panel

The DL.2 display panel gives access to the fixture's onboard menu system. *Chapter 3: The DL.2 Menu System* describes the menu system configuration options in detail.

Note: ***Most configuration features are also available through the Content Management Application (CMA), see Viewing Fixture Configuration Values on page 152.***

Software Setup

Verifying and Uploading Fixture Software

The latest fixture software is always available at the High End Systems website, (www.highend.com/support). You can view the fixture's currently installed software version under the **Info** tab of the fixture's menu system, (see *Info_Version Screen* on page 32) or through the CMA's **All Servers** view, (see *Verifying Software Versions* on page 149).

To upgrade the fixture software, first download the file from the website to your computer. Then use the CMA to upload it to your DL.2 fixtures, (see *Upgrading DL.2 Fixture Software* on page 150).

Installing and Launching the Content Management Application (CMA)

The Content Management Application software that shipped on CD with your fixture communicates with DL2 fixtures over an Ethernet network to:

- Upload and download custom digital content to fixtures
- Remotely control all menu commands
- Update software

The following are recommended hardware requirements for the CMA:

- Windows XP or Mac OS 10.4 or later
- Microsoft .Net Framework 1.1 with Service Pack 1 installed
- 100/1000 base Ethernet card (a Gigabit Ethernet card is recommended for fast content uploading of large files)

After setting up your Ethernet network and linking all DL.2 fixtures and your computer, Insert the CD that shipped with your fixture to automatically install the CMA on your harddrive. For more information on CMA operation, see *Chapter 14: Content Management Application (CMA)* on page 135.

Note: If the CMA doesn't automatically launch, navigate to the* dl2client.msi *file in your windows browser and double click to launch.

You can download the latest version of the CMA from the High End Systems website at www.highend.com/support. A download wizard simplifies installation on your personal computer.

When you launch the CMA, it automatically finds and identifies all DL.2 fixtures on the fixture link.

Note: To avoid problems with fixture communication over the ethernet link, disable all firewall programs on your computer when using the CMA.

Configuring DL.2 Fixtures

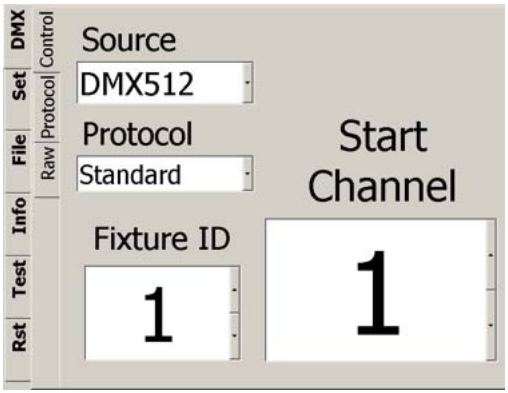
Before programming the DL.2 fixtures from a DMX512 console, you need to:

- Identify the DMX Source for the fixture
- Select the Protocol type to determine the DMX channel range this fixture will utilize
- Select a Fixture Number to identify this fixture on the DL.2 fixture link (required if you will be synchronizing output between fixtures).
- Assign a valid Start Channel (the first channel in the unique range of DMX channels designated by the console for this fixture)

You can configure fixtures directly using the DL.2 menu system or remotely using the Content Management Application.

Setup Configuration Using the Menu System

All setup parameters are located on the DL2 fixture's menu **DMX Screen.** For detailed information on using the DL.2 Menu System, see *Chapter 3: The DL.2 Menu System* on page *page 19*.



DMX **Source** defines the source of DMX data and has two options:

- **DMX512**—Data is transmitted over standard DMX cables.
- **Art-Net**—Data is transmitted over Ethernet cables using the Art-Net protocol. Set the number of DMX Universes (and DL.2 Ethernet Subnetworks containing this fixture from 0–16).

Choose from three DMX **Protocol** types:

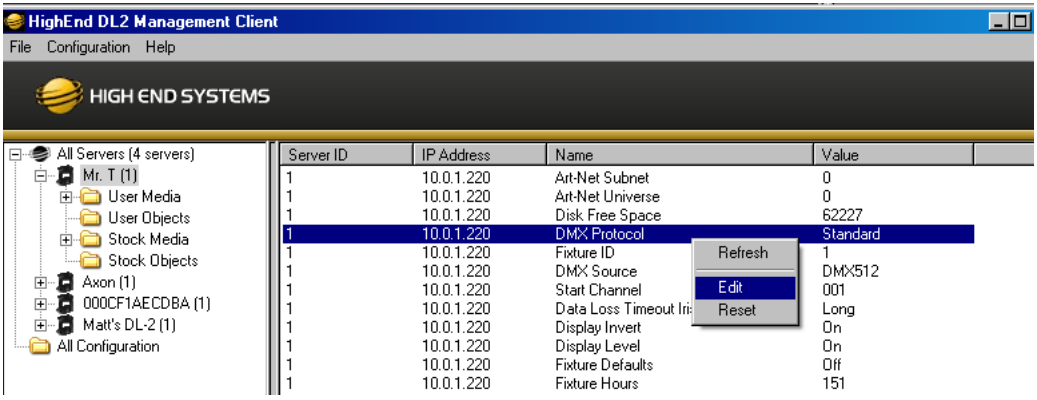
- Standard protocol requires 170 channels and enables all DL.2 parameters for direct DMX control.
- Dual protocol reduces the fixture footprint to 132 channels by implementing only two graphic objects.
- Single protocol simplifies DL.2 control to a single graphic object and uses 94 channels.

Select a valid **Start Channel** in the Start Channel field by using the up and down arrows on the multidirectional button to step through the numbers 1-512. For more information on choosing valid DL.2 DMX Start Channels, see *Determining a DMX Start Channel* on page 35.

- **Standard** protocol valid start channel = 1–343.
- **Dual** protocol valid start channel = 1–381.
- **Single** protocol valid start channels = 1–419.

Setup Configuration Using the CMA

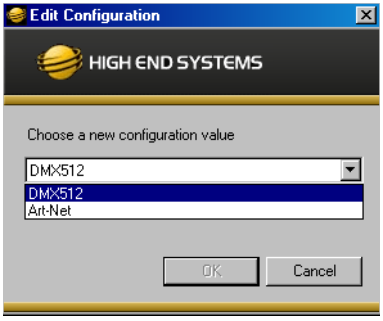
The Content Management Application running on your computer and linked to DL.2 fixtures via Ethernet lets you remotely configure the DL.2 fixtures. For more information on the CMA, see *Chapter 14: Content Management Application (CMA)* on page 135. To view configuration information for a individual server, click on All Servers in the left pane of the CMA window and select the + to view all the servers on the fixture network. Select a server in the left pane to view its configuration information in the right pane.



To select a **DMX Source** type:

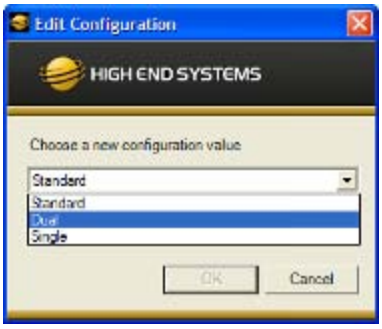
1. Scroll down the Configuration list in the right pane and double click on the line with DMX Source in the Name column to bring up the edit dialog box.

2. Choose between DMX512 and ArtNet as the source from the drop down list in the option field.



To Select a **DMX Protocol** type:

1. Scroll down the Configuration list in the right pane and double click on the line with DMX Protocol in the **Name** column to bring up the edit dialog box.
2. Choose **Standard**, **Dual**, or **Single** from the drop down list in the option field.



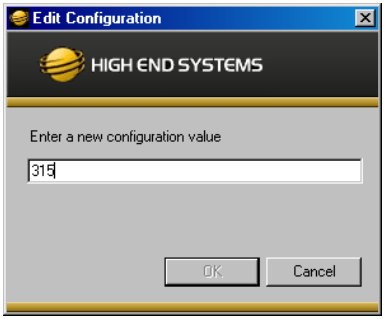
To edit the DMX **Start Channel**:

1. Scroll down the Configuration list in the right pane and double click on the line with Start Channel in the Name column to bring up the edit dialog box.
2. Enter a valid Start Channel for the protocol type you have chosen.

   Standard protocol = 1–343

   Dual Protocol = 1–381

   Single Protocol = 1–419



Shutting Down the Fixture

Recommended Shutdown Options

There are two recommended ways to shutdown the fixture:

1. A DMX controller can shut down the fixture's motion controls and projector remotely with the shutdown option of the control channel (see *Fixture Operations* on page 128).
2. The DL.2 fixture automatically shuts down in the event of DMX data loss. The default time is 10 min. To edit the length of time the fixture waits for a DMX input before shutting down, use the CMA (see *Editing Configuration Values* on page 152), or the fixture's menu system, (see *Set_Fixture Screen* on page 28).

WARNING:
Removing power directly without the shutdown sequence built into the two recommended procedures can severely reduce fixture reliability.

Placing Fixture in Road Case

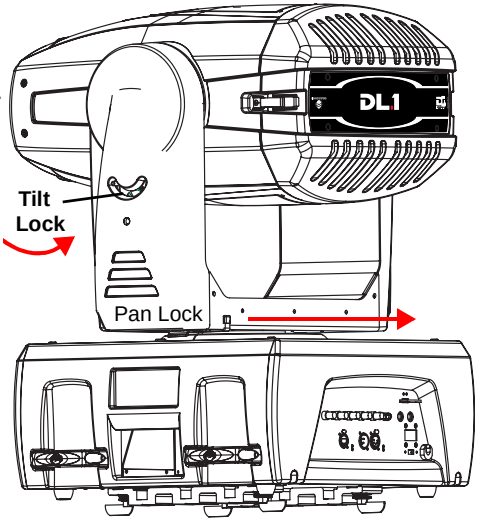
Before shipping the DL.2 fixture, lock its pan and tilt position so the fixture does not move during transit.

To lock the fixture:

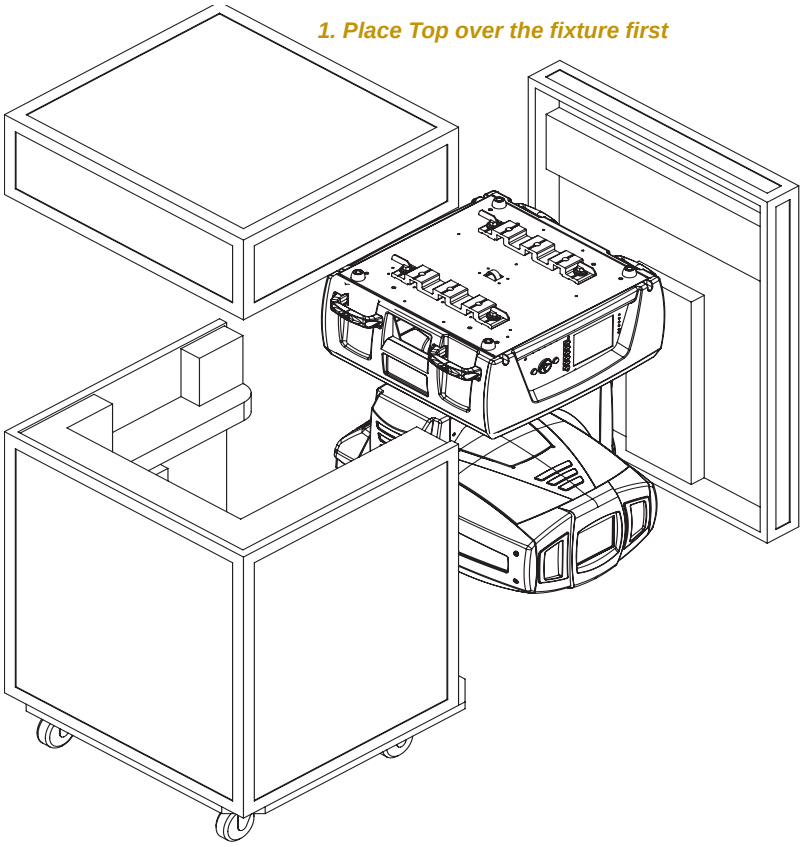
1. Orient the projector head pan position as shown for packing in the road case and secure with the pan lock located on the yoke base.

   Note: This is the only pan position that locks.

2. Move the tilt lock peg to the upper left (locked) position.
3. Gently move the projector head and yoke to verify that both pan and tilt positions are locked in place.



4. Place the DL.2 fixture in its provided road case for shipping.



Chapter 3:

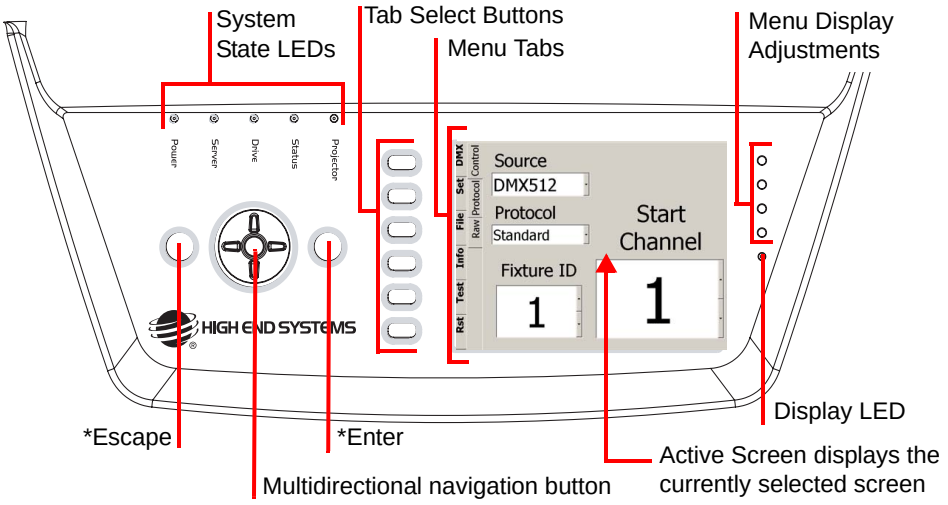
The DL.2 Menu System

You can use the DL.2 fixture's Menu System to configure the fixture, review diagnostic feedback, and view content information.

The DL.2 fixture use a 5" LCD screen to display the onboard menu system. Navigation and select buttons let you move to different tab levels and options displayed on the Menu screen.

Note: ***You can also access most Menu options through the CMA (see Chapter 14: Content Management Application (CMA) on page 135). Certain options can also be controlled remotely via a DMX console's Control channel (see Control Function Options on page 128).***

Menu Panel Components



* Function will automatically reverse when fixture is inverted.

The LCD screen displays the menu arranged with a series of **Menu Tabs** along the left side for accessing configuration screens and options on the currently active screen. Clicking on one of the **Tab Select** buttons selects the tab to the right of it on the screen.

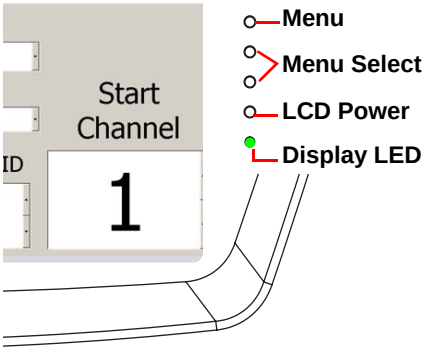
The large **Multi-directional** button controls movement between fields. The **Escape** button to the left cancels a selection and the **Enter** button to the right selects and stores a selection.

Functionality for each of these three buttons automatically reverses when the fixture is rotated to keep operation consistent. You can also manually set this option (see *Display Options* on page 28).

The fields in the **Active Screen** display current configuration settings and uses drop down boxes, numeric up/down selectors, and other user interface options to select in editable fields.

LCD Display Adjustment Buttons

The four **LCD Display Adjustment** buttons next to the LCD screen control and provide visual adjustments for the menu display.



Menu Display Adjustment Buttons

LCD Display Power Button

The button nearest the green LED is the LCD display power button. Holding it down for two seconds turns the Menu display on or off. Use this in situations when you need to turn the Menu display completely off instead of dimming it to video black.

If you turn the LCD off and then remove power to the DL-2, the LCD power will restore the default (ON) when you reapply power to the fixture.

Note: ***The LCD screen power button doesn't affect power to the fixture or the internal projector***

LCD Display Menu Options and Selection

The button furthest from the green LED is the menu button. Pressing this brings up the different functions contained in the LCD screen itself. The screen menu options are:

- **Picture** adjusts the sharpness of the screen
- **Color** adjusts the richness of the color
- **Contrast** adjustment
- **Black Level** adjustment
- **Tint** adjustment
- **Restore** returns the screen to the factory defaults

The other two buttons are used to adjust the currently selected function.

Note: ***Display Black Level can also be controlled by the DL.2 menu system (see* Set Tab *on page 28) or remotely through the configuration options in the CMA (see* Editing Configuration Values *on page 152).***

Navigating the Menu

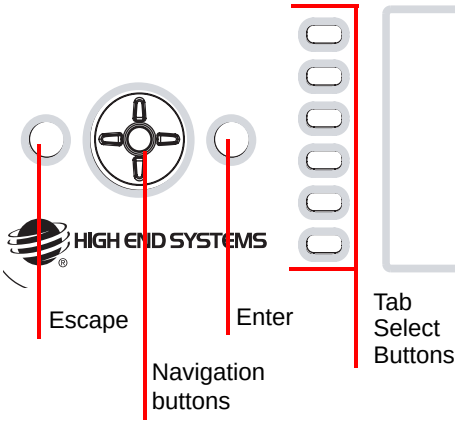
Select any tab by pressing the corresponding button to the side of the display. The tab label will be bold when selected. Use the left and right arrow keys on the navigation buttons to move to a different screen.

Press the Tab Select button corresponding to the screen you want and press the <**Enter**> button to select.

Use the multidirection button to move left/right/up/down to a field. The currently selected field will be highlighted.

Press the <**Enter**> button to go into edit mode the selected field and a list box will open to show all the options for that field.

Use the Up/Down keys to scroll through the items in the list highlighting the current item. Pressing the <**Enter**> button again stores the selection and closes the list.



To edit a field, press the <**Enter**> button to pop-open the drop down list where up/down selects the item. Pressing <**Enter**> again commits the change. Pressing the **<Escape>** button instead of **<Enter>** leaves the original setting and closes the list.

To return to a high tab level, press the left direction on the Navigation button.

DL.2 Menu Options

The menu display consists of a set of top-level tabbed screens and their associated subtabs.

Main Tab	Sub-Tabs / Screens		Fields Controls	Options	Function / Notes
DMX	Control		Source	DMX512	Sets DMX as fixture communication source
				Art-Net	Set Universe field from 0-16 [Art-Net protocol]
					Set Subnet field from 0-16 [Art-Net protocol]
			Protocol	Standard	Motion + global + 3 objects = 170 channels
				Dual	Motion + global + 2 objects = 132 channels
				Single	Motion + global + 1 object = 94 channels
			Fixture ID	1-255	Assigns the fixture a unique number on fixture network
			Start Channel	1-512	Sets the fixture's DMX start channel
	Raw View		Main Table		Displays DMX values for all 512 DMX link channels in rows of values.
			Offset		Scrolls through rows of DMX values
			Refresh Rate	0-44	Times/second for refreshing displayed values
			Refresh Timer	On	DMX values updated instantly
				Off	Display does not refresh
	Protocol View	Motion			Displays fixture Movement and Camera parameter values
		Global			Displays Intensity, Iris, Edge Fade, Viewpoint and Keystone correction parameters values for the composite image
		Obj 1			Displays Position, Rotation, Scaling, and Effects parameters values for the selected graphic object
		Obj 2			
		Obj 3			
Set	Fixture		Pan Invert	On	Inverts the direction of the pan motor.
				Off	Default
			Tilt Invert	On	Inverts the direction of the Tilt motor.
				Off	Default
			Pan/Tilt Swap	On	Swaps Pan and Tilt directions
				Off	Default
			Data Loss Timeout Iris	Long	Closes iris after a 5 minute DMX data loss
				Short	Closes iris after a 5 second DMX data loss
			Display	On	Default intensity adjustment — *Note: Unless you select Off, you can adjust display intensity level.*
				Preview	Displays current content preview
				Off	Turns off display after a period of time
			Display Invert	On	Inverts menu display and navigation
				Off	Turns off the display invert
				Auto	Automatically inverts display >45°

Main Tab	Sub-Tabs / Screens	Fields Controls	Options	Function / Notes
Set	Fixture	External SVideo	NTSC_M NTSC_MJ PAL_B PAL_D PAL_G PAL_H PAL_I PAL_M PAL_N SECAM_B SECAM_D SECAM_G SECAM_H SECAM_K SECAM_K1 SECAM_L SECAM_L1	Identifies the SVideo format used for video input.
	Projector	Factory Defaults	On	Restores factory default settings
			Off	Default
		Projector Input	External	Chooses the input the Projector will accept
			Internal	
		Projector In by DMX	Yes	Selecting Yes allows projector's input source to be selected from DMX
			No	Disables changing projector input via DMX
		Projector Lamp	On	Manually turns Projector Lamp on
			Off	Manually turns Projector Lamp off
		Projector Startup Mode	Always	Turns the projector lamp on whenever the fixture is connected to power
			Manual	Turns on the projector lamp when Projector Lamp = On
			DMX	Turns the projector lamp on with DMX input (default)
		Projector OSD Menu	On	Navigation buttons control Projector Menu System
			Off	Navigation buttons control Fixture Menu System
		Zoom Override	On	On Overrides the DMX values sent by the console. Set value manually from 0-255
			Off	
		Focus Override	On	On Overrides the DMX values sent by the console. Set value manually from 0-255
			Off	
		Projector Defaults		Selecting button restores Factory Projector Defaults
		Projector Ceiling	On	Rotates the image 180 degrees
			Off	Default
		Projector Rear	On	Inverts the image for projection from behind a screen
			Off	Settings do not match factory defaults
File				Displays content file locations and allows a content preview *(see page 33)*.

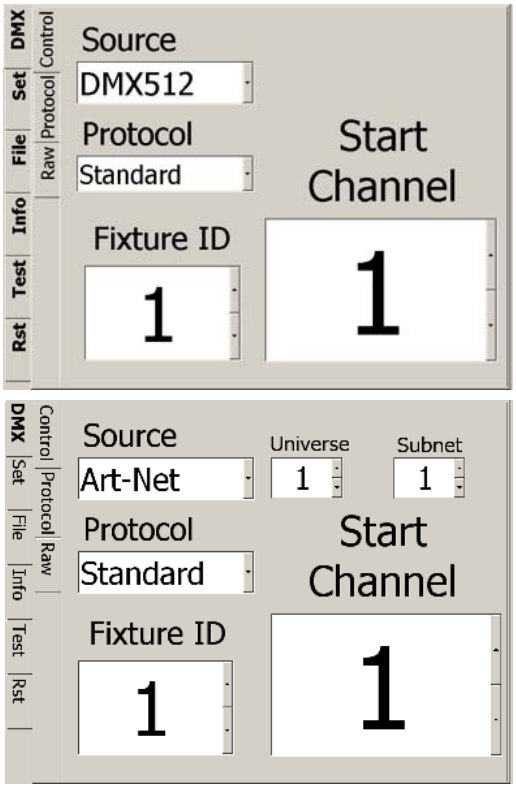
Main Tab	Sub-Tabs / Screens	Fields Controls	Options	Function / Notes
Info	Temp	Box	Reset	Displays fixture base housing's current, minimum and maximum temperature. Pressing Reset reverts all settings to the current temperature
		Head	Reset	Displays current, minimum and maximum temperature of fixture head. Pressing Reset reverts all settings to the current fixture head temperature
	Version	Software Version		Displays currently installed versions
		Firmware Version		
		Windows XPe		
		Pan Encoder Version		
		Tilt Encoder Version		
		Unique ID		Displays Internal ID
		IP Address		Displays fixture's IP address
		Fixture Name		Displays a currently assigned Fixture Name
	Hours	Lamp Hours	Reset	Monitors lamp, fixture, and filter hours of operation. Selecting Reset reverts hours to 0.
		Fixture Hours		
	Status	Motion Shutdown		Displays system activity and errors. For more information, see *Chapter 15: Maintenance and Troubleshooting* on page 157.
		Projector Status		
		Lamp Status		
		Projector Air Filter		
Test	Home	Motion All	Home	Resets all mechanical functions to default positions
		Motion Pan/ Tilt		Resets Pan and Tilt functions to default positions
		Motion Iris/ Zoom/ Focus		Resets mechanical functions for Iris, Zoom, and Focus to default positions
	Self Test	Self Test Pan/Tilt	On	Selecting On starts a test sequence for Pan and Tilt mechanical functionality
			Off	
		Self Test Iris	On	Selecting On starts a test sequence for Iris mechanical functionality
			Off	
		Self Test Zoom	On	Selecting On starts a test sequence for Zoom mechanical functionality
			Off	
		Self Test Focus	On	Selecting On starts a test sequence for Focus mechanical functionality
			Off	
		Video Test	On	Selecting a Video Pattern and On displays a sample video to test graphics engine functionality.
			Off	
Reset		Reboot Media Server		Selecting Restart reboots the internal media server
		Delete User Content		Selecting Delete erases all User Content on server
		Upgrade Factory Content		Selecting Upgrade installs updates to factory content (requires connection to the CMA)

Menu Screen Descriptions

Menu screens are presented on the display as a tabs. Sub-levels for a specific menu appear as that tab as is selected.

DMX Tab

The DMX screen lets you configure the fixture for the DMX link, view the DMX settings for the fixture on each channel of its range, and view all 512 channel values on the DMX link.



DMX_Control Screen

Use the Control Tab to configure your fixture.

You can choose from three DMX **Protocol** types:

- **Standard** protocol requires 170 channels and enables all DL.2 parameters for direct DMX control.
- **Dual** protocol reduces the fixture footprint to 132 channels by implementing only two graphic objects.
- **Single** protocol simplifies DL.2 control to a single graphic object and uses 94 channels.

DMX **Source** defines the source of DMX data and has two options:

- **DMX512**—Data is transmitted over standard DMX cables.
- **Art-Net**—Data is transmitted over Ethernet cables using the Art-Net protocol. Set the number of DMX Universes (and DL.2 Ethernet Subnetworks containing this fixture from 0–16).

Scroll through the numbers 1-512 in the **Start Channel** field to set a valid start channel for the protocol you have chosen:

- Standard protocol = 1–343
- Dual Protocol = 1–381
- Single Protocol = 1–419

For more on choosing valid DL.2 start channels, see *Determining a DMX Start Channel* on page 35.

You can assign each fixture a unique **Fixture ID** number from 1-255. This allows the fixture to be identified on the DL.2 ethernet fixture link for tasks like synchronizing playback between DL.2 fixtures and uploading custom content with the Content Management Application (CMA). You can manually set this number in the menu or through the CMA, see *Fixture Identification* on page 136. For more on DL.2 Ethernet fixture links, see *Setting up an Ethernet Fixture Link* on page 11.

DMX_Protocol Tab

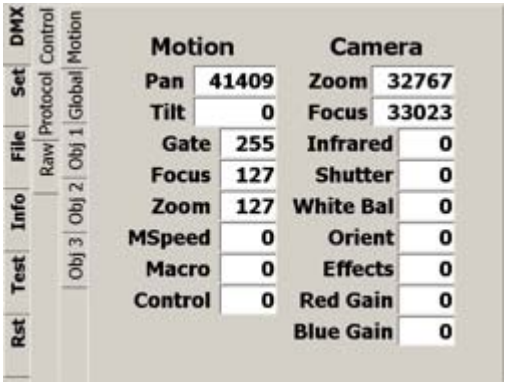
This tab displays the current DMX value being received from a console for each parameter after any conversion, such as internal self test or protocol conversion. The DMX parameters are grouped into general categories, each with a separate tab. For more information on individual parameters and their DMX value ranges, see *Appendix A: DL.2 DMX Protocol on page 177.*

DMX_Protocol_Motion Screen

The **Motion** tab displays parameters associated with fixture movement, projector control and integrated camera functionality.

For more information on specific Motion and Camera parameters, see:

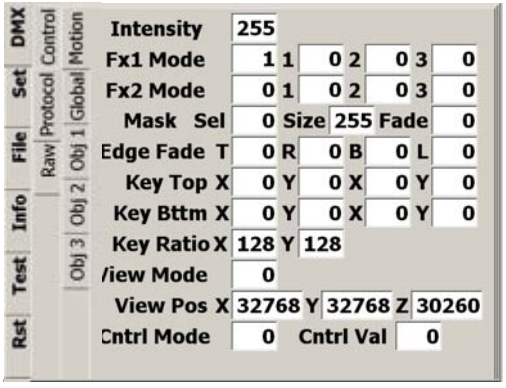
- *Chapter 12: Fixture Motion Functions* on page 127
- *Chapter 13: Live Video Input and Control* on page 131.



DMX_Protocol _Global Screen

The **Global** tab display the current values for parameters that affect the composite image.

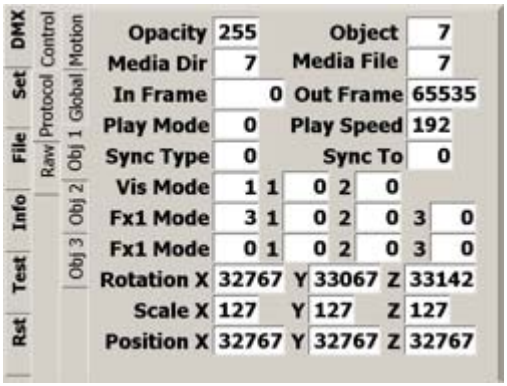
For more information on specific Global parameters, see *Chapter 10: Global Functions* on page 81.



DMX_Protocol _Obj Screens

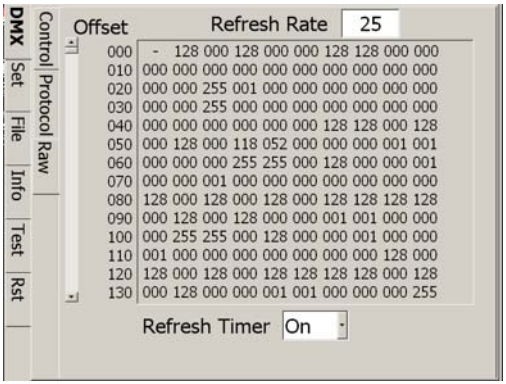
Obj 1, **Obj 2**, and **Obj 3** tabs display parameters values affecting a single object's content. For more information on specific Graphic Function parameters, see:

- *Chapter 6: Graphic Functions: Defining Content* on page 43;
- *Chapter 7: Graphic Functions: Rotation, Position, Scale* on page 51;
- *Chapter 8: Graphic Functions: Opacity and Effects* on page 65; and
- *Chapter 9: Graphic Functions: Synchronizing Content* on page 79.



DMX_Raw Screen

You can view the DMX values of all fixtures on the link. The **Raw** Tab displays every DMX value for Channels 001–512 in lines of eight DMX values each per screen. The **Offset** number at the beginning of each line indicates the first DMX channel with a value displayed on that line. Use the scroll bar at the left of the offset number to scroll through all the values.



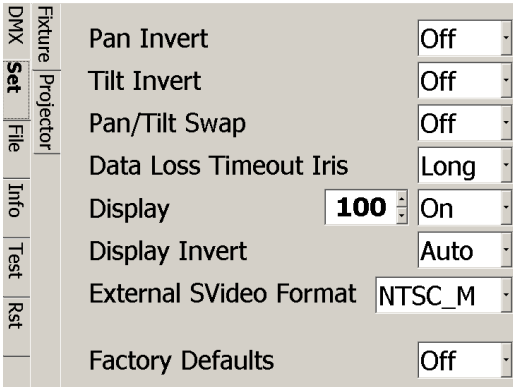
The **Refresh Rate** is the rate at which DMX is being received by the fixture.

With **Refresh Timer** set to **On**, you see the raw DMX values updated instantly.

Set Tab

Set_Fixture Screen

The Fixture tab provides options for selecting or changing fixture movement, dimming the mechanical iris, and controlling the LCD display black level and orientation.



Movement Options

Set the **Pan Invert** option **On** to invert the direction of the pan motor. Use this option to coordinate movements between fixtures facing each other in a horizontal orientation. **Off** is the default setting.

Set the **Tilt Invert** option **On** to invert the direction of the tilt motor. Use this option to coordinate movements between fixtures facing each other in a vertical orientation. **Off** is the default setting.

Setting **Pan Tilt Swap** option **On** swaps the pan and tilt motor operation to coordinate movements between fixtures mounted perpendicular to each other. **Off** is the default setting.

Timeout Options

The Dimmer Iris closes when it stops receiving DMX data for a designated time interval. The **Data Loss Timeout Iris** option sets the DMX data loss time interval as **Long** (5 minutes) or **Short** (5 seconds). Short is the default setting.

After 10 minutes of no data, the fixture will shut down the projector and the motion functions. Fans remain on to maintain the temperature control for the internal graphics engine.

Display Options

The **Display** field lets you adjust the black level of the Menu display with the following options:

- **On** is the factory default.
- **Preview** displays the most recent media change of any Graphic function, when opacity > 0. The DL-2 Menu screen displays content in both partial and full screen. The Preview function can be enabled from the DL-2 menu, the CMA, as well as remotely via DMX.
- When Preview is enabled, a partial, full color video is shown on the LCD display along with the folder, file, and DMX information. If there is no change of content on any Graphic Function it will automatically switch to full screen mode within 12 seconds.
- The Preview function always shows the latest selected content without any modification of effects. Preview mode displays movies and still images only. S-video and internal camera input will not be displayed in the Preview mode.

Note: ***After selecting the* On *or* Preview *option, you can use the numeric up/down control to adjust the Menu display brightness level from 25 (dim) to 100 (brightest).***

- **Off** turns off the display after 20 seconds of inactivity. Touching any button on the fixture menu will re-enable the display.

The **Display Invert** field inverts the display and navigation control functions. This is useful in certain fixture orientations. There are three invert control options:

- **On** manually inverts the display and navigation buttons
- **Off** manually turns off the display invert function
- **Auto** sets the display to invert automatically when the fixture is rotated more than 45% off the horizontal axis. This is the default setting.

The Multiple SVideo Format field lets you designate which SVideo format the fixture will accept. DL.2 fixtures support multiple SVideo formats including:

NTSC_M	PAL_B	PAL_H	SECAM_B	SECAM_K
NTSC_MJ	PAL_D	PAL_I	SECAM_D	SECAM_K1
	PAL_G	PAL_M	SECAM_G	SECAM_L
		PAL_N	SECAM_H	SECAM_L1

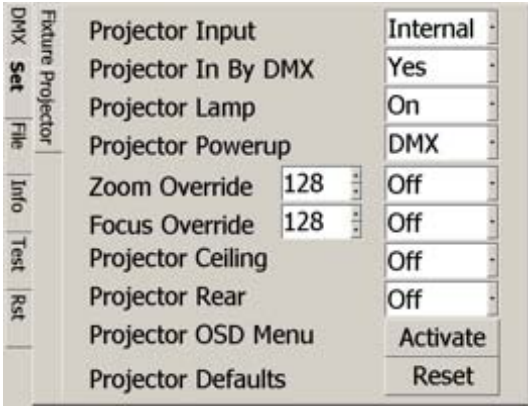
Note: The format must be set to NTSC_M to receive input from the internal camera.

Restoring Factory Defaults

Selecting **On** in the **Factory Defaults** field restores all factory default fixture settings.

Set_Projector Screen

The projector tab provides settings related to the internal projector functionality.



Use the **Projector Input** option to select which input the projector should accept. When **External** is selected, the projector takes input directly from an external source and bypasses the internal graphics engine. When **Internal** is selected, the projector takes input directly from the graphics engine. Internal is the default configuration setting.

Setting the **Projector In By DMX** field to **Yes** sets DMX as the projector's input source.

The **Projector Lamp** field lets you manually turn the lamp **On** or **Off**.

Use the **Projector Powerup** to choose the control option for turning the lamp on. The options are: ALWAYS ON, MANUAL, DMX. This only takes effect when the fixture powers up.

- **Always On** turns the projector lamp on when the fixture starts up regardless of whether there is a DMX/Art-Net signal. If there is no DMX/Art-Net signal the lamp shuts off when the shutdown timeout period expires.
- **Manual** turns on the projector lamp only when set to On via DMX, Menu or the CMA.

- **DMX** only turns the lamp on when it receives a DMX signal or Art-Net signal connected to it.

When the internal projector menu is selected for display, you may need to manually adjust the zoom and /or focus parameters to view the display clearly. The **Zoom Override** and **Focus Override** options override the DMX values sent by the console and allow you to control Zoom and focus manually with a DMX decimal value between 0-255.

Projector Ceiling rotates the image 180 degrees so you can adjust for whether the fixture is hung in the air or sitting on the floor.

Projector Rear projects a mirror invert of the image for rear-screen projection applications.

Projector Control Menu can be set to **On** to display the projector's menu system. In this state, the directional front panel buttons (multi-directional switch and the buttons on either side of it) control the projector menu rather than the LCD menu.

To revert back to the Menu display, press one of the six side menu buttons. When the Projector Control Menu is set to **Off**, the projector control menu is not displayed.

Turning **Projector Defaults** On will reset all the options on the Projector tab to their factory default settings. For more information, refer to the Projector User Manual that shipped with your DL.2 fixture.

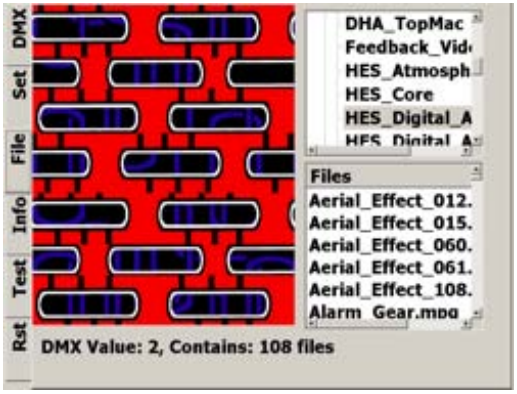
Projector Menu Command	Default
LANGUAGE	ENGLISH
CEILING	OFF
REAR	OFF
INPUT3	SVIDEO
SYSTEM	AUTO
INPUT1	RGB
SCREEN	NORMAL
INPUT2	RGB
POWER MANAGEMENT	OFF
LOGO	OFF
ON START	OFF
FANSPEED	NORMAL
LAMP_MODE	NORMAL
DISPLAY	OFF
BLUE_BACKGROUND	OFF
R_CODE	001

File Screen

The **File** screen displays information about the currently selected content file. Use this screen to preview content — both still images and movies.

When you select the File tab, the file plays in the window to the left. The bottom right window displays content folders and highlights the current file location.

You can scroll through the Content folders and the files inside each folder to preview any content file.



Test Tab

Test_Home Screen

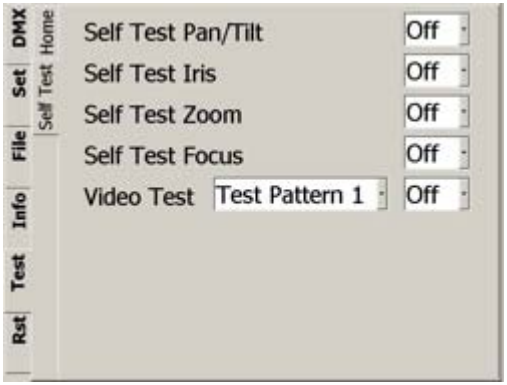
Homing sets a fixture to it's default positioning. The fixture automatically homes whenever it is connected to power.

You can manually home all or separate mechanical functions using this menu tab.

- **Motion All** option on this manually homes the entire fixture.
- **Motion Pan/Tilt** homes only pan and tilt positions.
- **Motion Iris/Zoom/Focus** sets the Iris, Zoom and Focus to default.
- **Calibrate Motors** realigns the Pan and Tilt stepper motors after maintenance procedures.

The DL.2 can also be remotely homed via a DMX controller, (see *Control Function Options* on page 128**)** or through the Content Management Application, (see *Editing Configuration Values* on page 152).

Test_Self Test Screen



You can check the mechanical functionality of **Pan/Tilt**, **Iris**, **Zoom**, and **Focus** assemblies on the fixture head. Select **On** to start the test sequence.

The **Video Test** option opens the mechanical iris and provides test patterns to check the projection functionality. This lets you verify that the graphics engine is operating without having to use a DMX controller.

Info Tab

The Info tab displays current fixture information such as hardware and software versions, sensor status, total fixture and lamp hours, DMX errors, and Status values. You can also reset Lamp and Fixture hours.

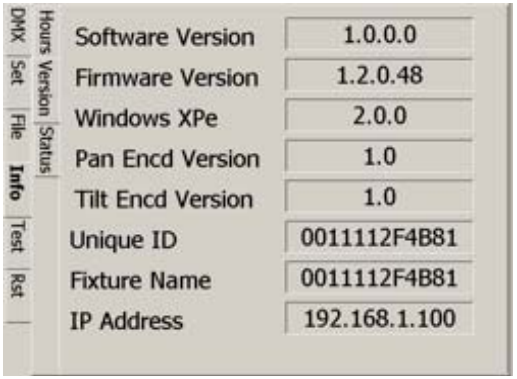
Info_Hours

The **Hours** tab displays the **Lamp** and **Fixture** hours of operation since the last reset. Selecting the **Reset** button resets the associated hours to zero. **Lamp** hours should be reset to zero whenever a lamp is replaced. **Fixture Hours** information is often used to track fixture hours for a show or a rental period. The number field displays the number of hours the fixture has been operating since the last reset. Pressing the Fixture Hours Reset returns the value to 0.

Info_Version Screen

The **Software Version** field and **Firmware Version** field display software versions as: V(Major).(Minor).(Build)

A **Fixture Name** field displays a name for easy reference in developing your show using the Content Management Application.

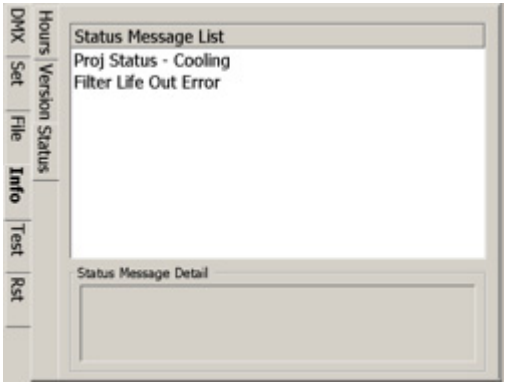


Info_Status Tab

This screen displays status errors and warnings on items including:

- Temperature
- Filter life
- Lamp life
- USB and Camera Communication
- USB Security

For more detailed information, see *Supported Error/Warning Messages* on page 166.



Reset Screen

The Reset screen provides options to reset, shutdown and upgrade software.

Reboot Media Server restarts the fixture's internal graphics engine software.

Delete User Content removes all user content on the selected fixture(s).

Upgrade Factory Content lets you reinstall factory content in a recovery situation.

Note: A copy of the DL.2 Factory Content can be obtained only from **High End Systems** *customer service.*

Chapter 4:

DMX Programming Basics

If you are new to DMX programing, this chapter will give you a brief overview and tips on programming DL.2 fixtures with Wholehog consoles from High End Systems.

DMX Programming Overview

DMX512 Links

A lighting console typically utilizes a protocol called DMX512 to communicate with automated lighting fixtures and conventional dimmers. This protocol consists of 512 unique channels of control per output link (universe). Typically a lighting fixture or device will use a channel for each parameter's function. Each channel consists of 256 values ranging from 0 to 255. The lighting console is programmed to transmit a corresponding DMX value for the desired function of each parameter. All DMX values are stored within in the lighting console, and typically are referred to as cues, scenes, or presets. A lighting console locates a fixture on the link by it's DMX Start Channel.

Determining a DMX Start Channel

The DMX Start Channel is the first channel of a fixture's channel range on a DMX link. There are 512 available channels on each DMX universe divided among all the devices in a particular universe. A fixture must have a unique DMX Start Channel number in order to respond independently to controller commands.

To determine each fixture's DMX Start Channel, identify the footprint of every fixture on the universe. The fixture's footprint is the number of consecutive DMX channels a fixture requires and is determined by the channels in the fixture's protocol.

The fixture's DMX channel range must not overlap any other device's channel range on the link. When two devices on the same DMX universe have overlapping channel ranges, one or both devices will be disabled or behave erratically.

8-bit vs. 16-bit DMX Parameters

Most parameters of an automated light use one channel of DMX providing 256 values of control (0-255). This is known as 8-bit DMX. Although most DL.2 parameters use 8-bit DMX, several require a more accurate range of values than can be provided with a single DMX channel.

By utilizing two DMX channels for a single parameter, 65535 values become available for controlling and adjusting parameter functions. This is known as 16-bit DMX. You can adjust 16-bit DMX values in both coarse and fine increments. The first channel of the pair provides coarse control changes of the DMX value in increments of 256. The second channel provides fine control and changes of the DMX value in increments of 1.

Lighting Consoles

Lighting consoles differ in many aspects and it is important to understand how your console operates with DL.2 fixtures.

Fixture Libraries:

Many sophisticated lighting consoles utilize pre-made fixture libraries. A fixture library consists of profiles for various types of lighting fixtures and devices. Each profile corresponds to the fixture's DMX protocol and allows for ease of programming. Depending upon the manufacturer of your lighting console, some DL.2 parameters might have different labels for parameter names and functions than are listed within this manual. Consult your lighting console manual for further information.

Using DL.2 Servers with a WholeHog Console

Adding a Fixture

The DL.2 fixture consists of three different "fixture types" in the Wholehog 3 library systems. This allows for ease of programming as well as the ability to adjust quickly for any of the various DMX protocol options. There are three basic "fixtures" used to control a single DL.2 unit. The **Motion** fixture type controls the actual moving yoke, projector, and integrated camera. The **Global** fixture type controls the global graphic engine functions such as intensity, keystone correction, viewpoint, etc. The **Graphic** fixture type controls each graphic object functions such as opacity, object, media, etc. The DL.2 protocol allows for 1, 2, or 3 graphic objects, and the Axon media server is a DL.2 fixture without the motion fixture type.

In the Fixture Schedule or Add Fixtures window of Wholehog software, add 1 motion, 1 global, and 3 graphic "fixtures" for each complete DL.2 unit. The best way to organize your patching is to assign user numbers for these items. Patch the motion first, the global second, and the graphic fixture types last. For example, set up user numbers 1-5 that correspond to DL.2 fixture number 1, where user number 1 is the motion, 2 is the global, and 3-5 the graphic fixture types.

DMX Output Displays

Although all lighting consoles output the same 512 DMX channels per universe, the on-screen labeling often differs. Parameter functions are displayed in either alpha-numeric descriptions (strobe 1), percentage (0-100%) or decimal (0-255 for 8-bit and 0-65535 for 16-bit). Consult your lighting console manual for further information.

16-bit DMX

Individual access of the two DMX channels used with 16-bit parameters varies by lighting console. Most modern DMX consoles bind these two channels into a single 16-bit parameter to accurately perform 16-bit crossfades. Consult your lighting console manual for further information.

Wholehog III Programming Notes

Play Speed

You can adjust the Play Speed using the encoder wheel on the Beam parameter of the Graphic fixture type. Additionally you can press “enable” and select “Media Speed Default On” to revert to the default speed setting (DMX 128). Then if you touch the encoder again the previous play speed will be recalled.

Mask Strobe

A unique function of the Wholehog 3 library system allows the creation of a special encoder type. Flying Pig Systems has created a parameter called “mask strobe” in the Global fixture type. When this is adjusted, it will automatically change the DMX value of the mask select channel to the appropriate value and adjust the DMX channel for the strobe speed. This will override the Mask Edge parameter as per the DL2 DMX Protocol.

Play Modes (Opacity)

Using the Graphic fixture type, press the Mode button to view the play mode options. By default all modes trigger normally. If available per the DL2 DMX protocol, you can select “Media Trigger Opacity” to change to the Play Modes that trigger when Opacity is greater than zero. To restore to normal triggering, select “Media Trigger Normal”.

CMY

The Global and Graphic fixture types both contain CMY controls for the Effect Mode modifier channels. The default for Effect Mode 1 is set to CMY1 as well. For some effect options, the CMY parameters will not adjust color, but will adjust the effect per the DL.2 DMX protocol. You can find a description of CMY controls functionality for each effect option in *Chapter 11: Effect Mode Options Descriptions* on page 97.

Control Channel Functions

Many of the control channel functions in the motion “fixture” only operate if the dimmer changes from >0 to 0 at the same time or just after a change is made to the control channel. See the DL2 protocol for specific information.

Chapter 5:

Graphics Engine Overview

The DL.2 fixture's graphic engine software gives you control over content selection, playback, 3-D environment you will use to select, image and project 3-D Video Lighting Content.

Working in the DL.2 3-D Environment

DL.2 fixtures provide individual and composite graphical control for up to three 3-D Objects. You can control the "footprint" of the fixture on a DMX link by choosing to implement only the number of 3-D objects your application requires. Select the protocol level in the fixture's onboard menu system (see *DMX Tab on page 25*).

Protocol Selection	DMX Channels
Standard Protocol	170
Dual Protocol	132
Single Protocol	94

Image Optimizing Controls

Images can now be optimized for each cue. It is no longer necessary to pre-optimize images with a separate software system on a separate computer when preparing for a show. You can adjust both Black Level and Contrast for each cue and for each image.

Graphics Control Hierarchy

There is a hierarchy to the DMX control parameters. In general, object control parameters render individual graphic images. Global control parameters act upon the composite image created by combining multiple objects. Motion parameters control the fixture movement and projection as well as live video feed from the internal camera.

It is especially important to keep this in mind when applying graphical effects. At the lowest level, Layer effects are applied to individual 3-D layers. Any Global effects applied affect each object in the combined Object image. Finally, motion effects control the projection of the composite image.

Graphics Engine Functions

Object Graphic Functions

For an individual object, you can control:

- The media file and 3-D object selection for the layer
- Media playback including
  - What portion of the movie plays
  - Playback speed
  - Playback mode (direction and style of playback)
- The object transparency (opacity)
- Visual Effects including colormixing and geometric effects
- Synchronization
- Image Rotation, Scale and Position

Global Functions

Global controls are applied to composite image created by multiple 3-D images. For the combined image, you can:

- Adjust the composite image intensity level
- Apply visual effects including colormixing and geometric effects
- Select a mask shape, size it and apply edge fades and color to the mask
- Apply and color mix an image edge fade
- Control keystone correction
- Establish the point in 3-D space from which image will be viewed

Making Graphics Effect Choices

Because you have control of many parameters, there are sometimes several ways to accomplish the same look. For Example, to make an object appear larger, you can scale it along the x, y and z axis, or you can apply a global control to zoom in on the z axis from a viewpoint that makes the object seem to increase in size.

Which solution you choose depends, to a large extent, on the transition to other effects you want to achieve.

DMX Protocol Overview

Mechanical Control		Global Control		Graphic Object Control			
Chan #	Description	Chan #	Description	Obj 1	Obj 2	Obj 3	Description
Motion		22	Global Intensity	57	95	133	Opacity
1	Pan	23	Global Effect 1	58	96	134	3-D Object File
2		24	Global Effect 1 Modifier 1	59	97	135	Media Folder
3	Tilt	25	Global Effect 1 Modifier 2	60	98	136	Media file
4		26	Global Effect 1 Modifier 3	61	99	137	In frame
5	Dimmer	27	Global Effect 2	62	100	138	
6	Focus	28	Global Effect 2 Modifier 1	63	101	139	Out frame
7	Zoom	29	Global Effect 2 Modifier 2	64	102	140	
8	Mspeed	30	Global Effect 2 Modifier 3	65	103	141	Play mode
9	Macro	31	Mask Select (default iris)	66	104	142	Play speed
10	Control Function	32	Mask Size	67	105	143	Sync Mode
Camera		33	Mask Edge	68	106	144	Sync To
11	Zoom	34	Edge Fade Top	69	107	145	Visual mode
12		35	Edge Fade Right	70	108	146	Visual Mode Modifier 1
13	Focus	36	Edge Fade Bottom	71	109	147	Visual Mode Modifier 2
14		37	Edge Fade Left	72	110	148	Graphic Effect 1
15	Infrared	38	Keystone Top Left X	73	111	149	Effect 1 Modifier 1
16	Camera Shutter	39	Keystone Top Left Y	74	112	150	Effect 1 Modifier 2
17	White balance	40	Keystone Top Right X	75	113	151	Effect 1 Modifier 3
18	Camera Orientation	41	Keystone Top Right Y	76	114	152	Graphic Effect 2
19	Camera Effects	42	Keystone Bottom Right X	77	115	153	Effect 2 Modifier 1
20	Red Gain	43	Keystone Bottom Right Y	78	116	154	Effect 2 Modifier 2
21	Blue Gain	44	Keystone Bottom Left X	79	117	155	Effect 2 Modifier 3
21	Blue Gain	45	Keystone Bottom Left Y	80	118	156	X-axis rotation
		46	X Ratio	81	119	157	
		47	Y Ratio	82	120	158	Y -axis rotation
		48	Viewpoint mode	83	121	159	
		49	Viewpoint Position X	84	122	160	Z-sxis rotation
		50		85	123	161	
		51	Viewpoint Position Y	86	124	162	Scale X
		52		87	125	163	Scale Y
		53	VIewpoint Position Z	88	126	164	Scale Z
		54		89	127	165	X Position
		55	Global Control	90	128	166	
		56	Global Control Modifier	91	129	167	Y Position
				92	130	168	
				93	131	169	Z Position
				94	132	170	

Chapter 6:

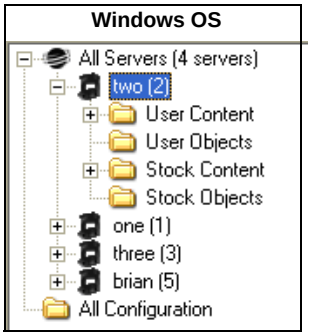
Graphic Functions: Defining Content

Each Graphic Object's content is composed of a 3-D object overlaid with a media file. This chapter outlines how to select an image's object and media file components as well as define the video segment and its playback.

Selecting Content

How Content is Organized

The media server on each fixture has a file system that holds the movies, images, and 3-D objects that make up the content that the server uses. These files, folders, and their associated DMX values are collectively known as the "Content" on the fixture.



The Content Management Application (CMA) organizes and identifies content by source (preloaded Stock content or custom User content) and type (Media files or 3-D Object files). For more information on using the CMA to view and manage content, see *Content Management Application (CMA)* on page 135.

Selecting Content

Three Parameters control Content selection. To define an image you have to set DMX values greater than 0 for the 3-D Object, Media Folder, and Media File parameters. The selected media file will be mapped onto the selected 3-D object.

To output an image from a DL.2 fixture:

1. Open the mechanical iris by setting the Dimmer parameter to full (100%)
2. Set the Global Intensity parameter to full (100%).
3. Set the Object opacity to full (100%)
4. Adjust the Object, Media Folder, and Media File parameters to greater than zero

When programming with Wholehog software, the Media Folder and Object parameters default to 1 so choosing any Media File DMX value from 1-35 will display a media loop from the HES Core folder (Media Folder 1) wrapped on a **Flat Plane** (Object 1).

Remember: ***The Dimmer, Opacity and Global Intensity Parameters all have to be greater than zero before the image you create becomes visible.***

Content Selection Parameters

The following sections outline parameters you will use to create an image from content and define it's playback. You will set the parameters described in this chapter for ***each*** individual Graphic Object you define.

Note: The suggested default DMX values given for each parameter are recommended to build libraries that provide the easiest and most reliable content selection, rendering and output. They are the default values built into the Wholehog libraries for High End Systems consoles.

Object

The **Object parameter** selects the 3-dimensional object component of an image. Object files are the 3-D object shapes used to build a total image. The DL.2 graphics engine supports a combined total of 255 stock and user-created object files.

Stock Objects have a fixed DMX value and cannot be edited. DMX values 1-149 are reserved for identifying stock object files. User created object files must be assigned a unique DMX value from 150-255.

For a reference of 3-D object files available as stock content with your DL.2 fixture and information on how to create your own object files, go to the link for the Stock Object Guide on http://www.highend.com/support/digital_lighting/dl2supportguide/.

Default DMX Value: 1 = full screen flat surface

TIP: You can select the same object file for images that will be interacting with each other. If both objects occupy exactly the same area in 3-D space, "Z-fighting" (a shimmering effect) on some portions of the composite image can occur as the graphics engine tries to determine which object should be in the foreground.

You can avoid this effect by making a slight adjustment to one of the object's scale or moving it forward or back (using the Z Position parameter) in respect to the other.

Media Folder

This parameter defines a folder (directory) containing a collection of media files. The media files within the assigned folder can then be selected using the Media File parameter. Media Folder DMX values are assigned as follows:

- DMX values from 1-38 select from the stock Media collections that shipped with your DL.2 fixture.
- A DMX value of 39 is reserved for a Setup and Test folder.
- DMX Values 40–239 are reserved for assignment to Custom folders containing user Media collections
- A DMX value of 255 selects the live video feed from the integrated video camera capture or S-Video input, (see *Chapter 13: Live Video Input and Control* on page 131 for more information).

Default DMX Value: = 1 (HES Core Media files)

Media Folder Descriptions

DMX Value	Media Folder Name	Content Description
1	HES Core Media Files	Premier High End Systems video loop collection
2	HES_Digital_Aerials_1	Digital still images and animations, designed specifically for aerial effects
3	HES_Oils	Digitally simulated psychedelic oil projection loops
4	HES_Atmospheric	Video loops of natural settings clouds, water, fire
5	On_The_Wall_Studios	Digital video loops, promotional
6	Sean_Bridwell	Digital video loops, promotional
7	A_Luna_Blue	Digital video loops, promotional
8	Feedback_Video	Digital video loops, promotional
9	HES_Textures	Video loop textures
10	HES_Foliage	Collection of abstract and realistic foliage and floral video loops
11	HES_Religious	Religious themed video loops
12	HES_Gothic	Set of themed video loops
13	HES_Digital_Aerials _2	Digital still images and animations, designed specifically for aerial effects
14	HES_Theme_Stills	Nature stills (foliage and flowers)
15	Apollo Glass 1	Digital Gobo Patterns, promotional
16	Artbeats	Digital video loops, promotional
17	DHA_TopMac	Digital patterns, promotional
18	Beacon DigiGobos	Digital video loops, promotional
19	Amorphous Digi-gobos	Digital animations, promotional
20	InLight	Digital video loops, promotional
21	HES_Lithopatterns_1	High End Systems Lithopattern® images
22	HES_Lithopatterns_2	More images from High End Systems Lithopattern library
23	HES_Logos	High End Systems® and DL.2™ logos
24	HES_Hi_Res	Variety of high resolution video backgrounds
25	NASA_Images	Space images from the Hubble telescope
26	Blue_Pony	Assorted video loops
27	Diagnostics	Setup and Test images
28-39	Reserved	Reserved for HES use
40-240	Open	Available for User Content
255	Video Input	Live video input from internal camera or external device

Media File

The Media File parameter lets you identify which Stock or User media file to apply (map) as a texture on the selected 3-D object. You can supplement the large library of Stock video loops and still images with Custom files. This parameter selects media files from within the folder defined by the Media Folder parameter.

For a reference of media files available as stock content with your DL.2 fixture, go to the link for the Stock Content Guide on http://www.highend.com/support/digital_lighting/dl2supportguide/. You can also view thumbnail images of media files in the CMA, (see *Viewing Files* on page 140.

Default DMX Value: 0 = No file selected

> ***Tip:*** ***You can preview a visual display of the media files loaded on a DL.2 fixture in the Content Management Application's thumbnails view, (see* Viewing Content *on page 139) or in the File Tab of a DL.2 fixture menu display (see* File Screen *on page 30).***

Defining a Media File Segment

You can define any portion of a video media file to play using the **In Frame** and **Out Frame** parameters. By default, the In Frame is the beginning of the media file and the Out Frame is the end of the file. Media files can have different lengths.

In Frame and Out Frame Parameters

You can select any segment of a media file for playback by assigning an In Frame value as a start point and an Out Frame as an end point.

> ***Note:*** ***DMX parameter values for these parameters do not correspond to a particular "frame". They are defined as a percentage of the movie length. This makes it possible to create segments with an Out Frame preceding the In Frame and simplifies playback synchronization between media files.***

The **In Frame** parameter corresponds to a 16-bit DMX value equal to a starting point for the playback segment of the selected file. The **Out Frame** parameter corresponds to a 16-bit DMX value equal to an end point for the playback segment of the selected media file.

Assigning the In Frame and Out Frame parameters to default DMX values will playback the entire movie file. Choosing other settings are useful when you want to:

- begin or end a media file at any point other than the default
- start or stop on a specific image
- you need to shorten the media file to a specific length

In Frame Default DMX Value: 0 = The beginning of a media file is the playback start point.

Out Frame Default DMX Value: 65535 = The end of a media file is the playback endpoint.

As you move from 0 to 100% of the **In Frame** value range, you can select the beginning of a media file segment as a percentage of the file length. Moving from 0 to 100% of the **Out Frame** value range selects the end of a media file segment as a percentage of the file length.

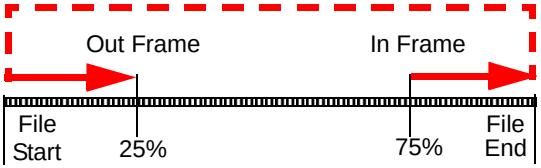
Segment Selection Examples

You can create a segment anywhere between the beginning and the end of a media file. The In Frame does not have to precede the Out Frame.

Example 1

To skip a segment in the center of a media file, set the In Frame to a point following the Out Frame. The file will play from the In Frame to the end and then start at the beginning of the file and play to the Out Frame. When you create a segment in this way, you may notice a jump as playback skips from the end of the file to the beginning.

Example 2



Defining Playback

After selecting and defining a media file segment to display on a 3-D object, you can choose from several Playback Modes and assign a Playback Speed.

Playback Mode

A **Playback Mode** parameter for each 3-D image allows several playback options.

Default DMX Value: 0 = Plays forward in a continuous loop

DMX Value	Playback Mode	Description
0	Play forward looping	Plays the media segment from In Frame setting to Out Frame setting, looping continuously
1	Play forward once	Plays the media segment from In Frame setting to Out Frame setting, and holds on the last frame
2	Pause	Stops playback at the frame currently playing
3	Play forward once if opacity > 0	Plays the media segment from In Frame setting to Out Frame setting, and holds on the last frame, Plays only when the content opacity value is greater than zero.
4	Play forward if opacity > 0	Plays media segment from In Frame setting to Out Frame setting, looping continuously. Plays only when the content opacity value is greater than zero.

DMX Value	Playback Mode	Description
5	Pause and rewind	Stops playback at the frame currently playing, then jumps to the In Frame setting.
6	Scrub In Frame	Displays frame that has been defined by the In Frame parameter
7	Scrub Out Frame	Displays frame that has been defined by the Out Frame parameter
8	Scrub In Frame with statistics	Displays frame that has been defined by the In Frame parameter with media file data overlaid on the output.
9	Scrub Out Frame with statistics	Displays frame that has been defined by the Out Frame parameter with media file data overlaid on the output.

Scrubbing displays the selected frame of the composite output of the DL.2 fixture. While scrubbing the In Frame, the frame selected by the In Frame coarse and fine channels will be displayed. Likewise, scrubbing the Out Frame will display the frame selected by the Out Frame coarse and fine channels. When the "with statistics" option is selected, the composite output includes text data related to the selected frame. Remember that the In Frame and Out Frame parameters are defined as a DMX value mapped to the percentage of the media file length, not a specific frame.

Note: If the Global Control Mode parameter = 255, a DMX value of 1-3 for the Global Control parameter provides an alternate font color to enhance statistics readability.

Playback Speed

The **Playback Speed** parameter controls the speed of the selected media file's Playback Mode. The Playback Speed for a media file is used whenever the Playback Mode Parameter's DMX value is assigned to any Play Forward option.

Default DMX Value: 128 = Playback at normal speed.

A DMX value of 0 or 128 (50%) plays back media files at the original recorded speed. DMX values from 1 to 127 plays the media file back at an increasing speed, from slowest to the original recorded speed. Values from 129-255 set playback speed from faster than normal to fastest speed.

Chapter 7:

Graphic Functions: Rotation, Position, Scale

You can independently control each Graphic Object's rotation direction and speed; along with it's position and scale in x, y, and z axis directions.

The parameters described in this chapter are set for each Graphic Object you define. Parameters for composite image rotation, position and global scale are described in *Chapter 10: Global Functions*.

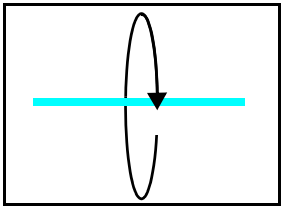
Note: The suggested default DMX values given for each parameter are recommended to build libraries that provide the easiest and most reliable content selection, rendering and output.

Rotating a 3-D Object

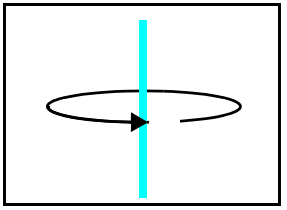
The **Rotation** parameters for each object control 3-D object rotation with 16-bit precision. You can rotate a 3-D object up to 720° in either a clockwise or counterclockwise direction around the X, Y and/or Z axis.

Note: Remember that rotation changes could affect an object's relationship to other objects.

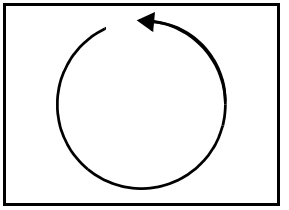
When you rotate an object, you are rotating it around the selected axis. **X Rotation** produces the effect of a top-to-bottom flip. **Y Rotation** produces a left-to-right flip. **Z Rotation** causes a circular motion.



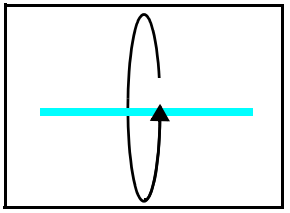
X Rotation
Rotates image about the x axis

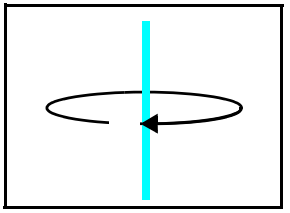


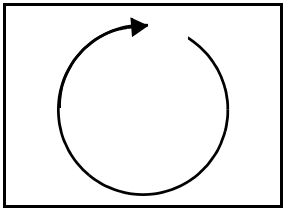
Y Rotation
Rotates image about the y axis



Z Rotation
Rotates image about the z axis

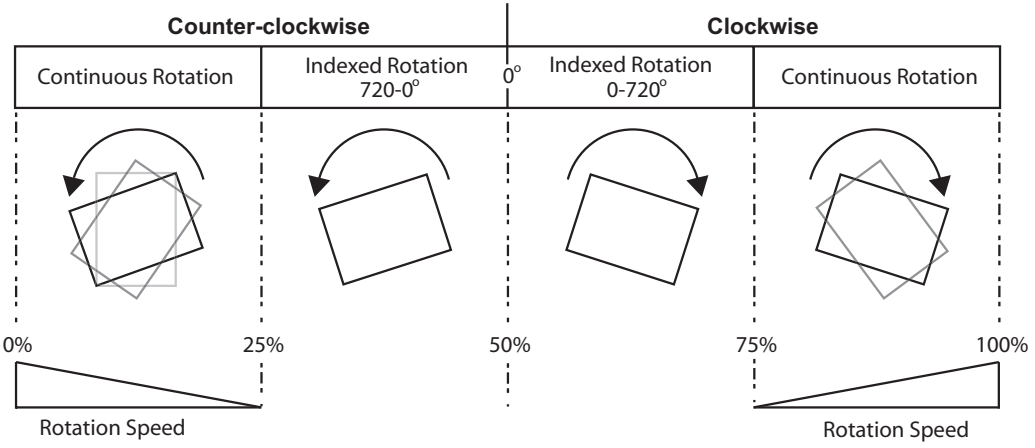






The Rotation parameters' suggested default values are the midpoint of the 16-bit DMX value range, which is equal to no rotation. Increasing the DMX value from the midpoint indexes the object in a clockwise direction. Reducing the DMX value below the midpoint indexes the object in a counterclockwise direction.

When the DMX value for a rotation parameter is greater than the 720° limit in either direction, the object begins rotating continuously. Additional adjustment to the DMX values increases the speed of continuous rotation.



Rotation Parameters

X Rotation

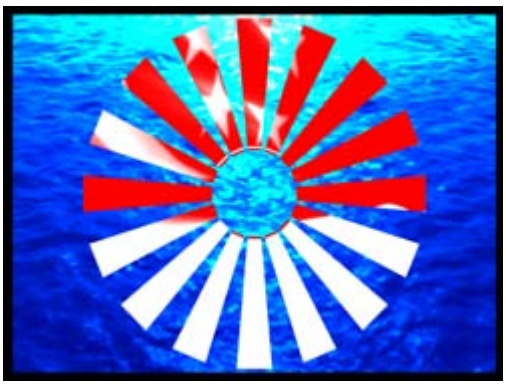
The **X Rotation** parameter rotates the selected Graphic Object around the x axis with 16-bit precision. You can index the rotation or set a continuous rotation creating a vertical flip at variable speeds.

This parameter lets you view an object from a different angle by turning the object. You can also view an object from a different angle by changing the viewpoint in space for the composite image, (see *Global Viewpoint Mode* on page 94).

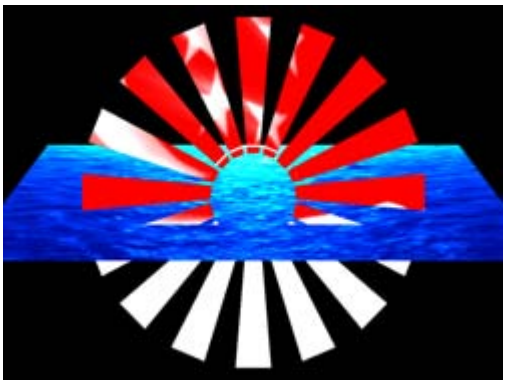
Default DMX Value: 32768 (50%) = No X Rotation

% of Value Range	Function
1–24	Continuous variable-speed counterclockwise image rotation around X-axis (fast to slow)
25	Continuous rotation stop
26–49	Rotates the image counterclockwise around X-axis in steps to –720 degrees
50	0° rotation around X-axis
51–74	Rotates the image clockwise around X-axis in steps to 720 degrees absolute
75	Continuous rotation stop
76–100	Continuous variable-speed clockwise image rotation around X-axis (slow to fast)

Tip: Using this parameter you can turn one object through another.



Original Object 1 and Object 2



X-axis Rotation Applied to Object 2

Y Rotation

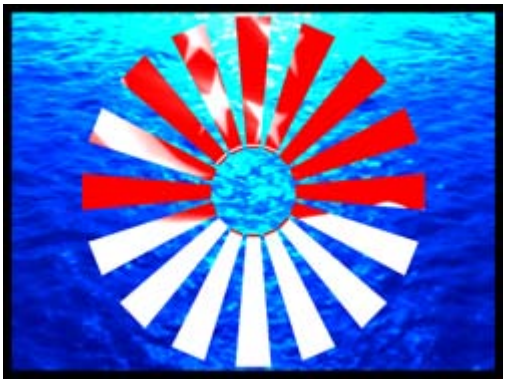
The **Y Rotation** parameter rotates or indexes the selected Graphic Object around the Y axis with 16-bit precision. You can index the rotation or set a continuous rotation creating a horizontal flip at variable speeds.

This parameter lets you view an object from a different angle by turning the object. You can also view an object from a different angle by changing the viewpoint in space for the composite image, (see *Global Viewpoint Mode* on page 94).

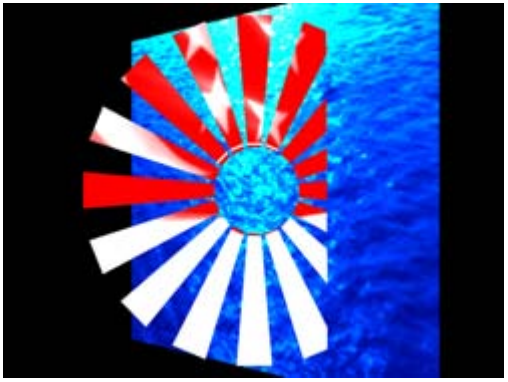
Default DMX Value: 32768 (50%)= No Y Rotation

% of Value Range	
1–24	Continuous variable-speed counterclockwise image rotation around Y-axis (fast to slow)
25	Continuous rotation stop
26–49	Rotates the image counterclockwise around Y-axis in steps to –720 degrees
50	0° rotation around Y-axis
51–74	Rotates the image clockwise around Y-axis in steps to 720 degrees absolute
75	Continuous rotation stop
76–100	Continuous variable-speed clockwise image rotation around Y-axis (slow to fast)

Tip: Using this parameter you can turn one object through another



Original Object 1 and Object 2



Y-axis rotation applied to Object 2

Z Rotation

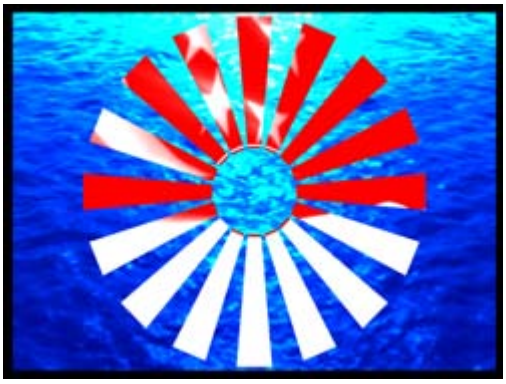
The **Z Rotation** parameter rotates or indexes the selected Graphic Object around the Z axis with 16-bit precision. You can index the rotation or set a continuous rotation creating a circular spin at variable speeds.

Default DMX Value: 32768 (50%)= No Z Rotation

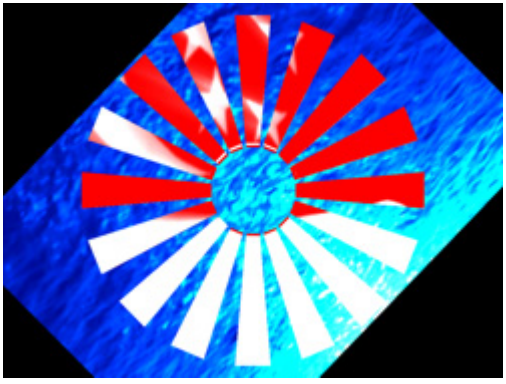
% of Value Range	
1–24	Continuous variable-speed counterclockwise image rotation around Z-axis (fast to slow)
25	Continuous rotation stop
26–49	Rotates the image counterclockwise around Z-axis in steps to –720 degrees
50	0° rotation around Z-axis
51–74	Rotates the image clockwise around Z-axis in steps to +720 degrees
75	Continuous rotation stop
76–100	Continuous variable-speed clockwise image rotation around Z-axis (slow to fast)

This parameter lets you view an object from a different angle by turning the object. You can also view an object from a different angle by changing the viewpoint in space for the composite image, (see *Global Viewpoint Mode* on page 94).

Tip: Using this parameter you can turn one object around another



Original Object 1 and Object 2



Z-axis Rotation Applied to Object 2

Scaling the Object

You can scale an Graphic Object along the X, Y and/or Z axis to adjust the object size.

The Scale parameter adjusts the size of the object's image up to approximately 10x its original size. At a DMX value of zero, the image shrinks to a dot. At the midpoint of the DMX value range, the image is normal size. When the DMX value is increased from the midpoint, the image is enlarged. In addition, when the DMX value is reduced below the midpoint, an inverted image is enlarged.

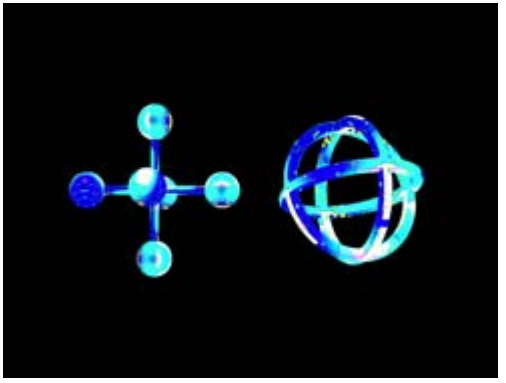
Use the **X**,**Y** and **Z Scale** parameters together to enlarge or shrink a 3-D object proportionally.

X Scale

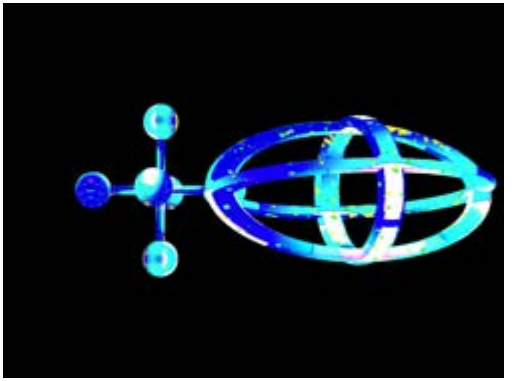
The **X Scale** parameter scales the selected 3-D object along the x axis, either expanding it or making it smaller. Use it when you want to size the object's horizontal component.

A DMX value of 128 (50%) sets the object at its normal size. Values less than 50% shrink the object horizontally to the smallest at 0. Values greater then 50% enlarge the object horizontally to the largest at 255 (100%).

Default DMX Value: 128 (50%) = Normal Scale



Original Object 1 and Object 2
All Scale DMX values = 128 (50%)



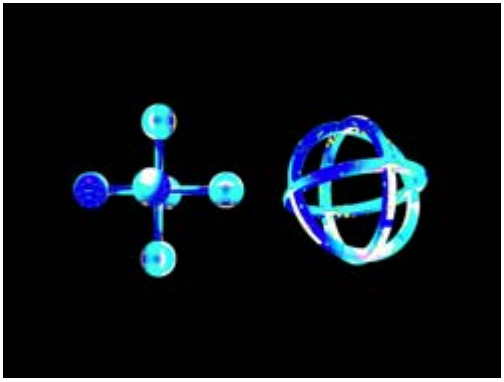
Object 2 X-Scale DMX value = 165
Scaled 3 times in X direction

Y Scale

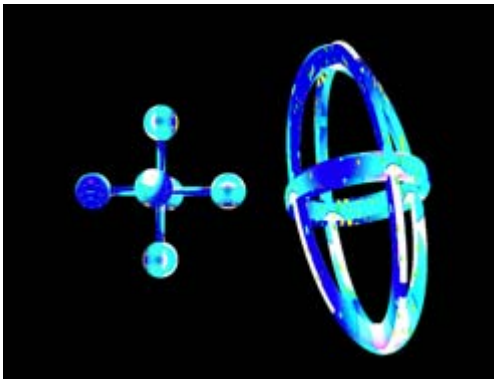
The **Y Scale** parameter scales the selected 3-D object along the y axis, either expanding it or making it smaller. Use it when you want to size the object's vertical component.

A DMX value of 128 (50%) sets the object at its normal size. Values less than 50% shrink the object vertically to the smallest at 0. Values greater then 50% enlarge the object vertically to the largest at 255 (100%).

Default DMX Value: 128 (50%) = Normal Scale



Original Object 1 and Object 2
All Scale parameters DMX values = 128 (50%)



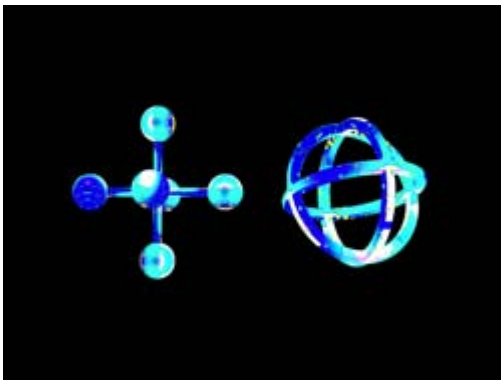
Object 2 Y-Scale parameter DMX value = 165
Scaled 3 times in Y direction

Z Scale

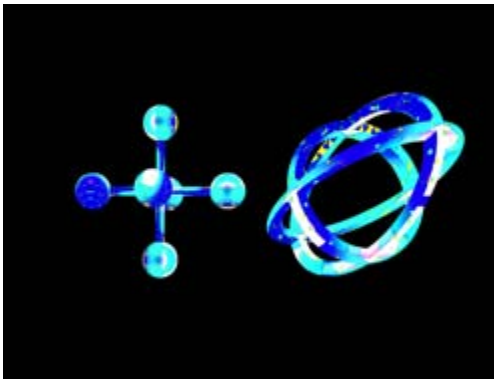
The **Z Scale** parameter scales the selected 3-D object along the z axis, either expanding or shrinking it. Use it when you want to size the object's thickness.

A DMX value of 128 (50%) sets the object at its normal size. Values less than 50% shrink the the object thickness until it reaches a point at a value of 0. Values greater then 50% enlarge the object to a maximum thickness at 255 (100%).

Default DMX Value: 128 (50%) = Normal Scale



Original Object 1 and Object 2
All Scale parameters DMX values = 128 (50%)



Object 2 Z-Scale parameter DMX value = 223
Scaled 7.5 times in Z direction

Changing Object Position

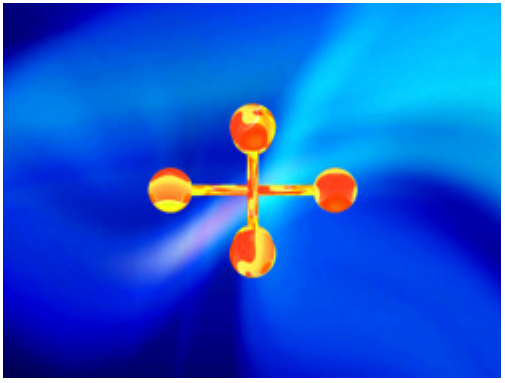
You can reposition each 3-D object's position in 3-D space by moving it along the X, Y and Z axes. The following parameters act on an individual object. Use these parameters to position 3-D images in relation to each other.

X Position

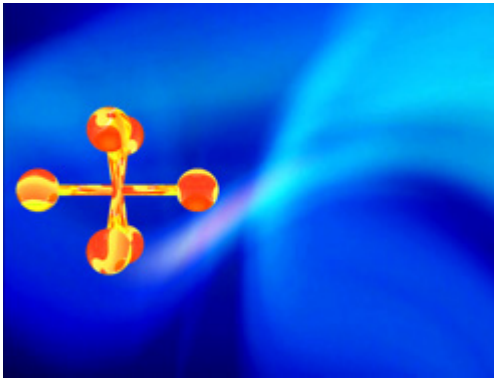
The **X Position** parameter moves your object along the x axis with 16-bit precision.

The midpoint of the 16-bit DMX value range centers the image on the X-axis. Values below the DMX midpoint move the object left, and values above the DMX midpoint move the object right.

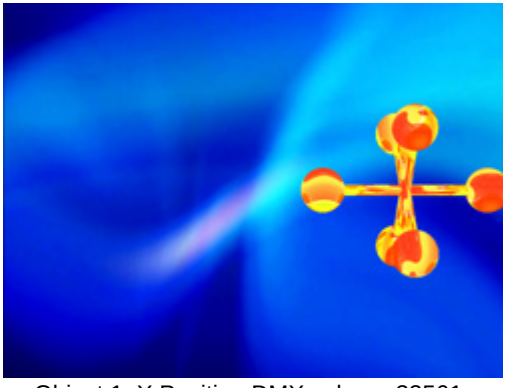
Default DMX Value: 32768 (50%) = object centered in frame



Original Object 1 and Object 2
All Position DMX values = 32768 (50%)



Object 1: X Position DMX value = 32022



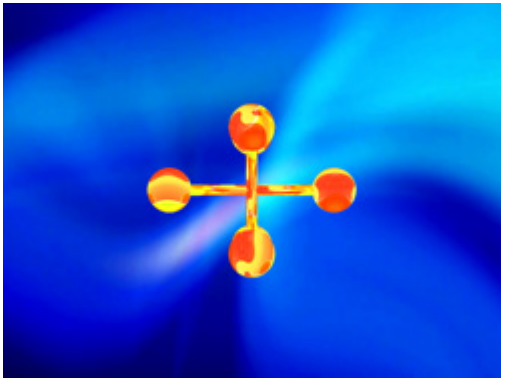
Object 1: X Position DMX value = 33561

Y Position

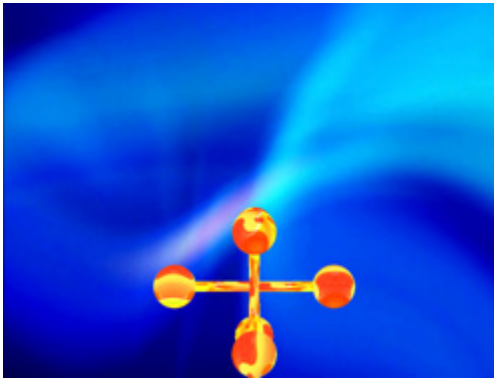
The **Y Position** parameter moves your object along the y axis with 16-bit precision.

The midpoint of the 16-bit DMX value range, centers the image on the Y-axis. Values below the DMX midpoint move the object down, and values above the DMX midpoint move the object up.

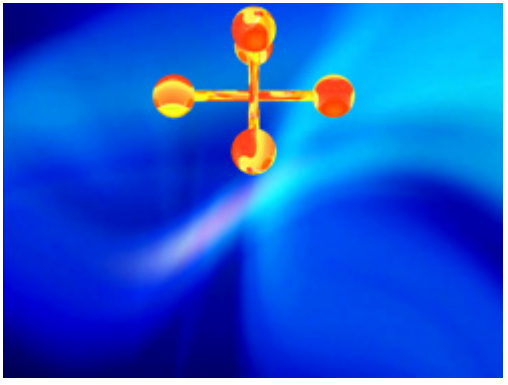
Default DMX Value: 32768 (50%) = object centered in frame



Original Object 1 and Object 2
All Position DMX values = 32768 (50%)



Object 1: Y Position DMX value = 32255



Object 1: Y Position DMX value = 33269

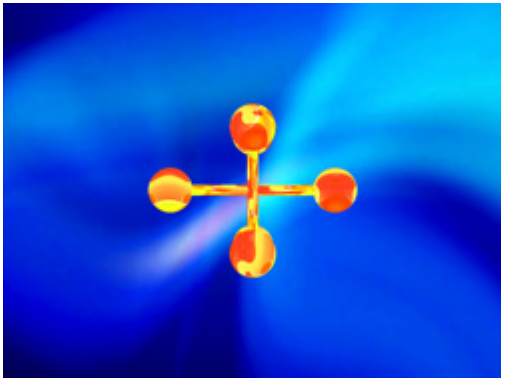
Z Position

The **Z Position** parameter moves your object along the z axis with 16-bit precision.

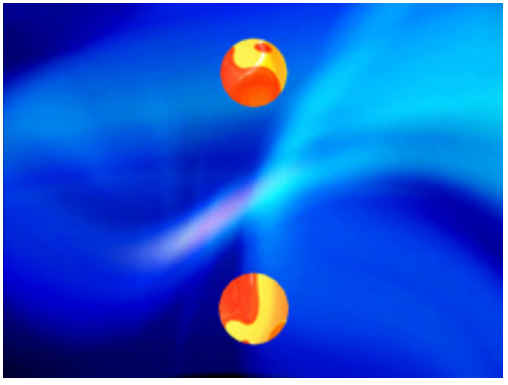
The midpoint of the 16-bit DMX value range centers the object on the z-axis. Values below the DMX midpoint move the object away from the viewer and appears to become smaller, and object above the DMX midpoint move the object toward the viewer and appears to become larger.

Default DMX Value: 32768 (50%) = object centered in frame

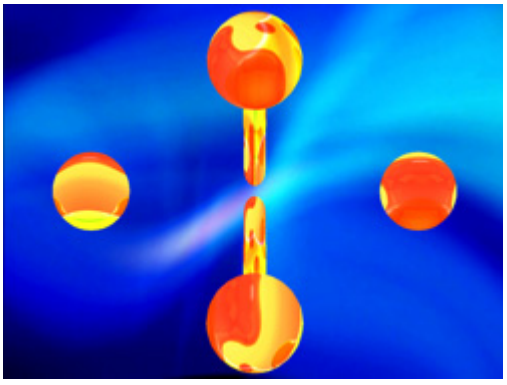
Tip: This parameter can create a zoom effect. Remember that by moving an object, you can obscure other objects or move it behind your viewpoint where it is no longer visible.



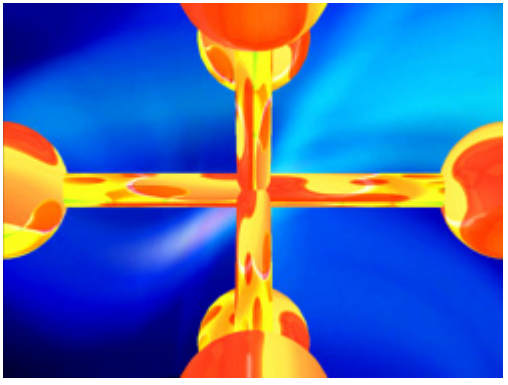
Original Object 1 and Object 2
All Position DMX values = 32768 (50%)



Object 1: Z Position DMX value = 31884



Object 1: Z Position DMX value = 32822



Object 1: Z Position DMX value = 33144

Chapter 8:

Graphic Functions: Opacity and Effects

You can adjust opacity and apply a variety of color mixing and geometric effects to each individual Graphic Object.

The parameters described in this chapter are set for each Graphic Object you define. Parameters for composite image intensity and effects are described in *Chapter 10: Global Functions* on page 81.

Note: ***The suggested default DMX values given for each parameter are recommended to build libraries that provide the easiest and most reliable content selection, rendering and output.***

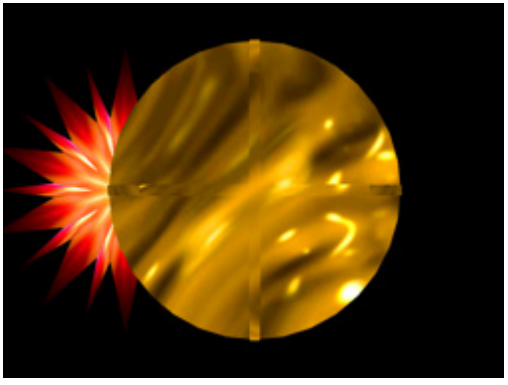
Opacity

Adjusting an object's opacity allows one object to "show through" another. You can adjust the opacity of an individual 3-D object from completely transparent to full opacity using this parameter. Increase opacity from not visible at a value of zero to full opacity at a value of 255.

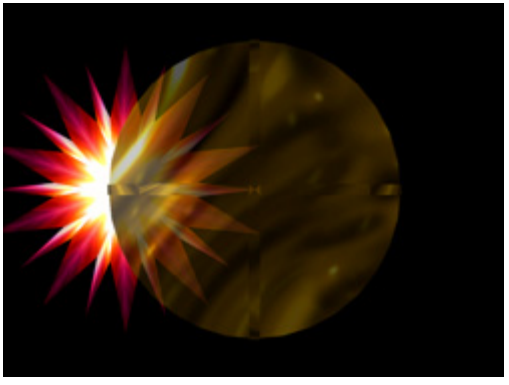
Default DMX Value: 0 = completely transparent

The Global Intensity parameter provides a similar adjustment to the combined image. This global control parameter controls intensity levels on the overall image (see *Global Intensity* on page 81). When you have multiple objects in relation to each other, the Global Intensity parameter is the best way to apply a fade to the composite image.

Tip: The **Dimmer**, **Object Opacity** and **Global Intensity** parameters all have to be greater than 0 to make a defined image visible.



Graphic Object 1 Intensity DMX = 255 (100%)
Graphic Object 2 Intensity DMX = 255 (100%)



Graphic Object 1 Intensity DMX = 255 (100%)
Graphic Object 2 Intensity DMX = 179 (70%)

Visual Mode

Visual Mode options are defined using three parameters. The **Visual Mode** parameter has options for enhancing and adjusting the black level and contrast of a 3-D object. Once you choose a visual mode, two **Modifier** parameters adjust the selected mode.

Note: In most cases, you won't see a change in the content until the Modifier parameters for that mode are adjusted.

Default DMX Value: 0 = Safe (no processing applied)

Modifier 1 Default DMX Value: 0 = Full Brightness

Modifier 2 Default DMX Value: 0 = No Contrast adjustment

The following table illustrates the interaction between the Visual Mode Parameter and the two associated Modifier parameters for each option.

Visual Mode Options			Adjustments	
DMX Value	**Name**	**Definition**	**Modifier 1**	**Modifier 2**
0	Safe	No visual mode processing applied to rendered output.	Not Used	Not Used
1	Content Optimization	Enhances image black level and contrast	Adjusts Back Level	Adjusts Contrast
2	Push to Sepia	Fades from original image color to sepia	Adjusts Fade	Adjusts Saturation
3	Push to Red	Fades from original image color to red tones	Adjusts Fade	Adjusts Saturation
4	Graymaker	Gradually transitions image from color to grayscale	Replaces color with gray	Adjusts brightness of grayscale image
5	Graymaker2	Converts image to grayscale	Adjusts grayscale image black level	Adjusts grayscale image contrast
6	Posterizer	Converts colors to their highest values without bleeding or blending	Reduces color detail	Adjusts Contrast
7	Color to B/W	Fades colors to black/white with no grays	Fades the color through B/W to White at 100%	Not Used
8	Fire Gradient	Maps original color intensity levels to a red-to-yellow gradient.	Fades original image to red-yellow gradient	Not Used
9	Negative Art	Reverses image color	Scales color	Subtract red to Subtract Green

10	Exposure Control	Alternate content optimization option	Expand/Contrast Color	Adjusts color shift
11	Invert B/W	Inverts Black and White components. Color remains unaffected	Sets Black Comparision Level	Sets White Comparison Level
12	Texture Mixing	Crossfades between the texture of another Graphic Object and the texture for the current Graphic Object	Source Graphic Object Texture	Controls Crossfade

Content Optimization

Visual Mode Parameter DMX value = 1

Stock content provided by High End Systems on your DL.2 fixture has been optimized for lighting applications. This option lets you make the same adjustments for User content or camera input. Content Optimization adjusts the image Black level and Contrast to optimize the projected image for your performance environment. You can use it to easily modify the black level and contrast for a specific application. The Exposure Control option provides an alternative algorithm for accomplishing this optimization.

Modifier 1: Adjusts black level from 0 = no adjustment to 255 (100%) = full black.

Modifier 2: Adjusts contrast from 0 = no adjustment to 255 (100%) for maximum contrast.

Tip: All the factory content provided has been optimized already. This parameter is especially useful for optimizing User content or camera capture.

Push to Sepia

Visual Mode Parameter DMX value = 2

This option converts all color in the image to sepia tones.

Modifier 1: Fades from original color at a DMX value = 0 to a range of sepia shades at a value of 255 (100%)

Modifier 2: Adjusts color saturation from no adjustment at a DMX value = 0 to full saturation at a value of 255 (100%)

Original Content
Visual Mode Parameter DMX value = 2

Visual Mode Parameter DMX value = 2
Visual Mode Modifier2 DMX value=255(100%)

Visual Mode Parameter DMX value = 2
Visual Mode Modifier1 DMX value=190(75%)
Visual Mode Modifier2 DMX value=255(100%)

Push to Red

Visual Mode Parameter DMX value = 3

This option reduces colors in the selected image to all Red values

Modifier 1: Fades from original color at a DMX value = 0 to a range of red tones at a value of 255 (100%)

Modifier 2: Adjusts color saturation from no adjustment at a DMX value = 0 to full saturation at a value of 255 (100%)

Original Content
Visual Mode Parameter DMX value = 3

Visual Mode Parameter DMX value = 3
Visual Mode Modifier2 DMX value=255(100%)

Visual Mode Parameter DMX value = 3
Visual Mode Modifier1 DMX value=190(75%)
Visual Mode Modifier2 DMX value=255(100%)

Gray maker I

Visual Mode Parameter DMX value = 4

This effect gradually transitions the color image to a grayscale image. Use the Gray Maker effect when you want to add an undertone of grey to the colors in an image.

NOTE: If content is already grayscale, there is no effect applied but Modifier 2 can still effect image contrast.

Modifier 1: At a DMX value of 0, the image will be full color. As you increase the DMX value, more gray is introduced until, at a DMX value of 255, all color has been replaced with shades of gray.

Modifier 2: Adjusts the brightness of the image at the grayscale transition level selected with the Modifier 1 parameter.

Original Content
Visual Mode Parameter DMX value = 4

Visual Mode Parameter DMX value = 4
Visual Mode Modifier1 DMX value=128(50%)

Visual Mode Parameter DMX value = 4
Visual Mode Modifier1 DMX value=190(75%)
Visual Mode Modifier2 DMX value=255(100%)

Gray maker 2

Visual Mode Parameter DMX value = 5

This option converts a color image to grayscale and then lets you adjust black level and contrast.

NOTE: If content is already grayscale, there is no effect applied but Modifier 2 can still affect image contrast.

Modifier 1: Adjusts the black level of the grayscale image from a DMX value of 0 = Full brightness to 255 = completely black

Modifier 2: Adjusts contrast of the grayscale image from 0 = no adjustment to 255 (100%) = maximum contrast.

Original Content

Visual Mode Parameter DMX value = 4

Visual Mode Parameter DMX value = 4
Visual Mode Modifier1 DMX value=90(33.3%)
Visual Mode Modifier2 DMX value=175(77%)

Posterizer

Visual Mode Parameter DMX value = 6

This effect uses the associated **Modifier 1** parameter to posterize by replacing each color in an image with the highest values of that color but expanding it only to the border of that color. There is no bleeding or blending of colors.

Note: In this visual mode, you won't see a change in the image until you adjust the Modifier 1 parameter

Modifier 1: Adjusts color polarization level. The higher the value, the more color detail will be removed.

Modifier 2: Adjust the image contrast from 0 = no adjustment to 255 (100%) = maximum contrast.

Original Content
Visual Mode Parameter DMX value = 6

Visual Mode Parameter DMX value = 6
Visual Mode Modifier2 DMX value=255(100%)

Visual Mode Parameter DMX value = 6
Visual Mode Modifier1 DMX value=190(75%)
Visual Mode Modifier2 DMX value=255(100%)

Color to B/W

Visual Mode Parameter DMX value = 7

Begins with a white screen and fades to the original image in black and white. All color is converted.

Modifier 1: Transitions the image from full white at a DMX value of 0 to black and white at a value of 128 (50%). Increasing values above 50% reveals more of the image in black and white to complete at a value of 255 (100%).

Modifier 2: Not Used

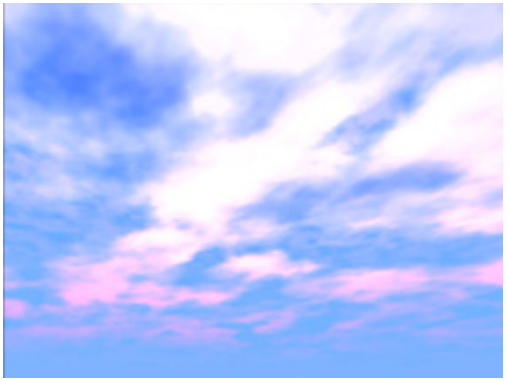
Fire Gradient

Visual Mode Parameter DMX value = 8

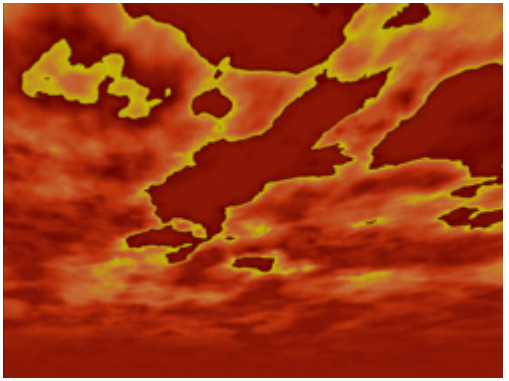
This option maps image colors to a Red-to-Yellow gradient creating a fiery effect.

Modifier 1: Maps the image color values from no adjustment at a value of 0 to all red to yellow tones at a value of 255 (100%).

Modifier 2: Not Used



Original Content



Visual Mode Parameter DMX value = 8
Visual Mode Modifier 1 DMX value=255 (100%)

Negative Art

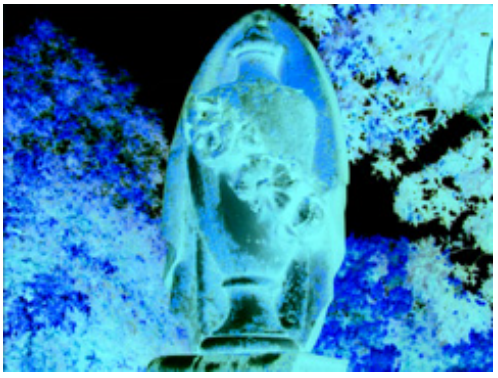
Visual Mode Parameter DMX value = 9

This option provides a negative of the image and then lets you adjust the amount of color and the red and green color components.

Modifier 1: Adjusts the color level from full at a DMX value of 0 to the lowest level at a DMX value of 255.

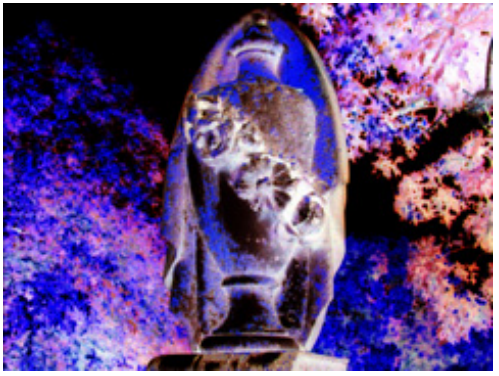
Modifier 2: You must set a DMX value of 128 to see no black level adjustment. Red is subtracted from the image at DMX values of 128 to 0. Green is subtracted from the image at DMX values of 129 – 255.

Original Content



Visual Mode Parameter DMX value = 9
Modifier 1 DMX value=0
Modifier 2 DMX value = 0

Visual Mode Parameter DMX value = 9
Modifier 1 DMX value=0
Modifier 2 DMX value = 128 (50%)



Visual Mode Parameter DMX value = 9
Modifier 1 DMX value=255 (100%)
Modifier 2 DMX value = 128 (50%)

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Exposure Control

Visual Mode Parameter DMX value = 10

Exposure Control adjusts the image Black level and Contrast to optimize the projected image for your performance environment. You can use it to easily modify the black level and contrast for a specific application.

Exposure Control provides finer Contrast and Black level control than than the Content Optimization option which pushes colors to saturation more quickly.

Modifier 1: Adjusts black level from 0 = full black through 255 (100%) = brightest. At a DMX value of 128 (50%) there is no adjustment.

Modifier 2: from 0 = least contrast through 255 (100%) = maximum contrast. At a DMX value of 128 (50%) there is no adjustment.

Tip: All the factory content provided has been optimized already. This parameter is especially useful for optimizing user content or camera capture.

Invert Black and White, Keep Color

Visual Mode Parameter DMX value = 11

This option allows you to invert the black and white components of an image while leaving other colors unaffecting. You can vary the threshold for the “black” in a pixel required for inversion.

Modifier 1: Adjusts the comparison level of black for inversion from a DMX value of 0= inverting only absolute black to 255 (100%) = converting more of the image from black to white.

Modifier 1: Adjusts the comparison level of white for inversion from a DMX value of 0= inverting only absolute white to 255 (100%) = converting more of the image from white to black.

Texture Mixing

Visual Mode Parameter DMX value = 12

Texture Mixing lets you crossfade from textures (media file content) of one Graphic Object to the texture of another Graphic Object. Any effects applied to the Source file do not display.

Modifier 1: Selects the Source file for the texture you want to pull. A DMX value = 1 selects Graphic Object 1’s media file content. A DMX value = 2 selects Graphic Object 2’s media file content. A DMX value =3 selects Graphic Object 3’s media file content.

Modifier 3: Adjusts Graphic Object opacity of the source texture from a DMX value of 0 = fully transparent to 255 (100%) = fully opaque.

Effect 1 Mode and Effect 2 Mode

Two **Effect Mode** parameters are available for each individual 3-D object, each with three **Modifier** parameters. Both Effect parameters have an identical list of color and visual effect options. This lets you apply a dual-effect combination to the selected 3-D object.

Note: ***Not all modes combine effectively. For example, you cannot glow a wobbulating object very well.***

The table below describes the interaction between an Effect Mode parameter and its three associated Modifier parameters. You can find a detailed description and example of each option in *Chapter 11: Effect Mode Descriptions* on page 93.

Note: ***Modifier channels for Effect Mode 1 are labeled as CMY in the Wholehog 3 system so you can also make use of the color picker, HSI, and other Wholehog 3 functions. Use the CMY parameter controls to adjust the three Effect Mode 1 Modifier parameters for both the Global and Graphic fixture types. The default for Effect Mode 1 is set to CMY1 as well. Effect Mode 2 Modifier channels are labeled Mod 1, Mod 2, and Mod 3.***

DMX Value	Effect Mode	Adjustments		
	Name/Definition	**Modifier 1**	**Modifier 2**	**Modifier 3**
0	**Safe**, no effects selection	NA	NA	NA
1	**CMY** (RGB inverse)	Cyan	Magenta	Yellow
2	**CMY add to all pixels**	Cyan	Magenta	Yellow
3	**CMY add to all non-black pixels**	Cyan	Magenta	Yellow
4	**RGB add, all pixels**	Red	Green	Blue
5	**RGB add 2, all pixels**	Red	Green	Blue
6	**RGB add to all non-black pixels**	Red	Green	Blue
7	**RGB swap to GBR**	Red to Green	Green to Blue	Blue to Red
8	**RGB swap to BRG**	Red to Blue	Green to Red	Blue to Green
9	**Solarize 1** If color value < DMX value, invert color	Red	Green	Blue
10	**Solarize 2** If color value > DMX, invert color	Red	Green	Blue
11	**Solarize 3** If color value < DMX, set color to 0	Red	Green	Blue
12	**Solarize 4** If color value > DMX, set color to 0	Red	Green	Blue
13	**DotP and resample**	Red	Green	Blue
14	**Color cycle** DMX value controls cycle speed	Red	Green	Blue

DMX Value	Effect Mode	Adjustments		
	Name/Definition	**Modifier 1**	**Modifier 2**	**Modifier 3**
15	**All or Nothing** If color value > mod value color = 255, else color = 0	Red	Green	Blue
16	**RGB, Solid color**	Red	Green	Blue
17	**RGB, Invert**	Red to Cyan	Green to Magenta	Blue to Yellow
18	**RGB, Invert and Swap to GBR**	Red to Magenta	Green to Yellow	Blue to Cyan
19	**RGB, Invert and Swap to BRG**	Red to Yellow	Green to Cyan	Blue to Magenta
20	**Edge Detect Color**	Horizontal search size	Vertical search size	Comparison threshold
21	**Edge Detect B/W**	Horizontal search size	Vertical search size	Comparison threshold
22	**Texture Ripple, Horizontal**	Amplitude	Frequency	Phase
23	**Texture Ripple, Vertical**	Amplitude	Frequency	Phase
24	**Texture Ripple, Circular**	Amplitude	Frequency	Phase and Direction
25	**Texture Ripple, Asymmetrical Circular**	Amplitude	Frequency	Phase
26	**Chromakey, Fine**	Red	Green	Blue
27	**Chromakey, Medium**	Red	Green	Blue
28	**Chromakey, Coarse**	Red	Green	Blue
29	**Chromakey Fine, Inverse**	Red	Green	Blue
30	**Chromakey Medium, Inverse**	Red	Green	Blue
31	**Chromakey Coarse, Inverse**	Red	Green	Blue
32	**Scan line** converts image colors to colors in a single line of the image	selects scan line	fades to converted image	Not Used
33	**Transparent Wipes** “opens” the selected graphic to reveal another graphic positioned behind it	Area of wipe	Selects center of wipe	Selects from 6 wipe options
34	**Pixel Twist** swirls a portion of the texture	x- twist center	y-twist center	direction and amount of twist
35	**Picture-in-picture** duplicates the texture and overlays it on the original	x subpicture center	y subpicture center	subpicture size

DMX Value	Effect Mode	Adjustments		
	Name/Definition	**Modifier 1**	**Modifier 2**	**Modifier 3**
36	**Magnifying lens** applies spherical overlay that magnifies a portion of the texture	x lens center	y lens center	lens size
37	**Magnifying lens 2** applies spherical overlay that magnifies a portion of the texture.	x lens center	y lens center	lens size
38	**Cartoon Edge** creates variable outline around picture elements	Reduces Color	Enhances Contrast	Edge detection sensitivity
39	**Color DeConverge** offsets pixels from original position	Moves Red pixels up	Moves Green Pixels down and right	Moves Blue Pixels down and left
40	**Horizontal Mirror** creates a mirror effect	Defines mirror center	Not Used	Not Used
41	**RGB swap to BGR**	Red to Blue	Green	Blue to Red
42	**RGB swap to RBG**	Red	Green to Blue	Blue to Green
43	**RGB swap to GRB**	Red to Green	Green to Red	Blue
44	**Colorize Gray Scale** maps pixel intensity to color	Selects Color Scheme	Selects zero intensity point	Controls fading
45	**Intensity key** turns pixels of selected intensity transparent	Selects Color Scheme	Defines Intensity bandwidth	Controls Transparency
46	**Raindrop** simulates raindrops falling on a liquid surface	Controls size/speed	Seeds random # generator	Controls raindrop rate
47	**RGB, Scale** varies color value	Red	Green	Blue
48	**Tiling On**	x-axis scaler	y-axis scaler	NA
49	**Color to Alpha**	Red to alpha	Green to alpha	Blue to alpha
50	**Color to Alpha, Inverted**	Inverted red to alpha	Inverted green to alpha	Inverted blue to alpha
51	**Texture Mixing**	Selects Source Texture	Selects Source Effect Level	Crossfade Between Textures
64	**Sinewave, Circular with x-axis wobbulation**	Amplitude	Frequency	Phase
65	**Sinewave, Circular with y-axis wobbulation**	Amplitude	Frequency	Phase
66	**Sinewave, Circular with z-axis wobbulation**	Amplitude	Frequency	Phase
67	**Sinewave, Horizontal with x-axis wobbulation**	Amplitude	Frequency	Phase
68	**Sinewave, Horizontal with y-axis wobbulation**	Amplitude	Frequency	Phase
69	**Sinewave, Horizontal with z-axis wobbulation**	Amplitude	Frequency	Phase

DMX Value	Effect Mode	Adjustments		
	Name/Definition	**Modifier 1**	**Modifier 2**	**Modifier 3**
70	**Sinewave, Vertical with x-axis wobbulation**	Amplitude	Frequency	Phase
71	**Sinewave, Vertical with y-axis wobbulation**	Amplitude	Frequency	Phase
72	**Sinewave, Vertical with z-axis wobbulation**	Amplitude	Frequency	Phase
73	**Glow** applies glow effect to 3-D object	Red	Green	Blue
74	**Glow Color Cycle**	Red cycle speed	Green cycle speed	Blue cycle speed

Chapter 9:

Graphic Functions: Synchronizing Content

After designating a master fixture with the Sync To parameter, you can synchronize the content of other fixtures to any Object on the master in terms of playback time, rotation or both.

Synchronization Parameters

Sync Mode

The **Sync Mode** parameter defines the type of synchronization between Graphic Objects. You can synchronize to the frame of the movie, the 3-D object rotation either forward or reverse, or both.

In DL.2 software, Synchronization is not “Slaving”. “Slaving” would mean that the master’s DMX values for the synchronized function(s) would override/replace the slave DMX values. The master, in this case The appropriate DMX channels for all the “synced” fixtures and the “master” fixture must be set to the same values for the synchronized functions to stay “in sync”.

When using the Sync Mode parameter, keep the following in mind:

- Any Sync Mode value above 15 (16-255) defaults back to 0
- Any settings affected by the synchronize mode you select need to be mirrored on both objects to synch correctly.
- Setting an object to sync to itself will have no effect.

Playback Timing

Synchronizing playback sets all applicable fixtures to a ***master clock*** so that all fixtures have a definite, synchronized starting point when playing back their sequences (or loops). The master fixture determines the sequence length for all the other fixtures in the link, regardless of the number of programmed scenes or the sequence length of the individual fixtures synchronizing to the master.

When the master fixture reaches the end of the selected media file segment, all fixtures will restart at In Frame point of their media file segment (regardless of whether the playback has come to the selected Out Frame) and all the ***clocks*** will be reset to zero. For example, if a synchronizing fixture’s media segment has a shorter sequence length than the master fixture’s media file segment, it continuously repeats its sequence until the master fixture resets all the clocks. If a synchronizing fixture’s media segment has a longer sequence length, it restarts at the In Frame point before completing its entire sequence.

DMX Default Value: 0 = no sync type selection

DMX Value	Option
0	No selection
1	Synchronize to Graphic Object 1 movie time
2	Synchronize to Graphic Object 2 movie time
3	Synchronize to Graphic Object 3 movie time
4	Synchronize to 3-D object rotation 1
5	Synchronize to 3-D object rotation 2
6	Synchronize to 3-D object rotation 3
7	Synchronize to reverse 3-D object rotation 1
8	Synchronize to reverse 3-D object rotation 2
9	Synchronize to reverse 3-D object rotation 3
10	Synchronize to Graphic Object 1 movie time and rotation 1
11	Synchronize to Graphic Object 2 movie time and rotation 2
12	Synchronize to Graphic Object 3 movie time and rotation 3
13	Synchronize to Graphic Object 1 movie time and reverse rotation 1
14	Synchronize to Graphic Object 2 movie time and reverse rotation 2
15	Synchronize to Graphic Object 3 movie time and reverse rotation 3

Sync To

The **Sync To** parameter allows you to synchronize multiple DL.2 servers with one DL.2 server as long as they are all on one network. The default applies to every server on the network.

Default DMX Value: 0 = No synchronization

Each fixture on the network is assigned a fixture ID. The **Sync To** parameter setting selects the ID of the fixture on the network that will provide the synchronization information to all other fixtures on the network. Currently, synchronization can be with only one fixture. The Synchronization server is selected with the **Sync To** parameter channel of Graphic Object One. The **Sync To** parameter channels for Graphic Objects 2 and 3 are reserved and default to 0.

> ***Tip:*** ***For sync to work, all fixtures should be assigned a Unique Fixture ID using the menu system (see DMX_Control Screen on page 25) or through the CMA (see Viewing and Editing Fixture Configuration on page 151).***

Chapter 10:

Global Functions

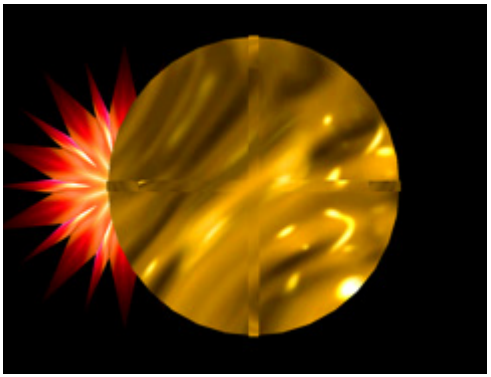
Global Graphic controls affect the composite image created by defining two or three separate object graphics. You can adjust intensity, define masks, select a point in space to view the composite image, and control keystone correction.

Global Intensity

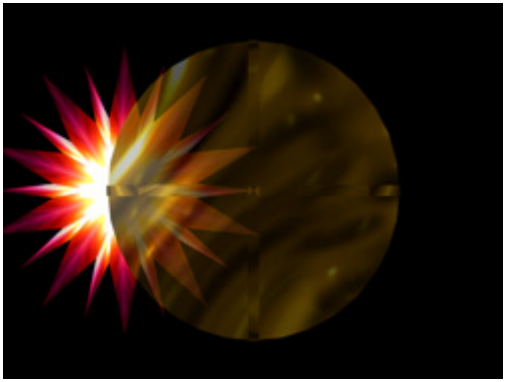
The **Global Intensity** parameter creates a smooth *fade to video black* that doesn't affect the opacity relationship between individual objects. Use this parameter to adjust the intensity of a composite image over the separate Graphic Object's Opacity parameter settings. Increase intensity from not visible at a DMX value of 0 to full intensity at a value of 255 (100%).

Default DMX Value: 0 = no intensity (video black)

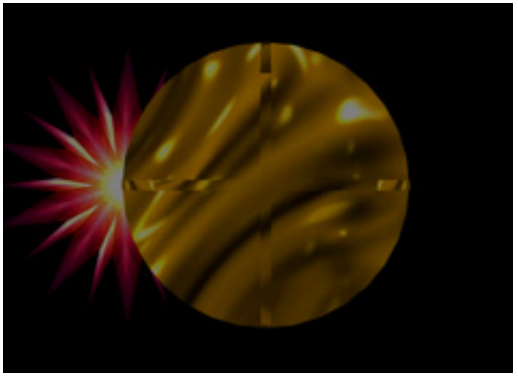
Tip: The Dimmer, Object Opacity and Global Intensity parameters all need DMX values greater than 0 for a defined image to be visible.



Graphic Object 1 Intensity DMX = 255 (100%)
Graphic Object 2 Intensity DMX = 255 (100%)



Graphic Object 1 Intensity DMX = 255 (100%)
Graphic Object 2 Intensity DMX = 179 (70%)



Global Intensity DMX = 128 (50%)

Global Effect Mode 1 and Effect Mode 2

There are two **Global Effect Mode** parameters, each with three modifier parameters. Both Effect Mode parameters have an identical list of color and visual effect options. This lets you apply a dual-effect combination to the composite image.

The table below describes the interaction between an Effect Mode parameter and the three associated Modifier parameters for each option. You can find a detailed description of each option in *Chapter 11: Effect Mode Descriptions* on page 93 .

Note: ***Modifier channels for Effect Mode 1 are labeled as CMY in the Wholehog 3 system so you can also make use of the color picker, HSI, and other Wholehog 3 functions. Use the CMY parameter controls to adjust the three Effect Mode 1 Modifier parameters for both the Global and Graphic fixture types. The default for Effect Mode 1 is set to CMY1 as well. Effect Mode 2 Modifier channels are labeled Mod 1, Mod 2, and Mod 3.***

Effect Mode		Adjustments		
DMX Value	**Name/**Definition	**Modifier 1**	**Modifier 2**	**Modifier 3**
0	**Safe,** no effects selection	NA	NA	NA
1	**CMY** (RGB inverse)	Cyan	Magenta	Yellow
2	**CMY Add, All Pixels**	Cyan	Magenta	Yellow
3	**CMY Add, All Non-black Pixels**	Cyan	Magenta	Yellow
4	**RGB Add, All Pixels**	Red	Green	Blue
5	**RGB Add 2, All Pixels**	Red	Green	Blue
6	**RGB Add, All Non-black Pixels**	Red	Green	Blue
7	**RGB Swap to GBR**	Red to Green	Green to Blue	Blue to Red
8	**RGB Swap to BRG**	Red to Blue	Green to Red	Blue to Green
9	**Solarize 1** If color value < DMX value, invert color	Red	Green	Blue
10	**Solarize 2** If color value > DMX, invert color.	Red	Green	Blue
11	**Solarize 3** If color value < DMX, set color to 0	Red	Green	Blue
12	**Solarize 4** If color value > DMX, set color to 0	Red	Green	Blue
13	**DotP and Resample**	Red	Green	Blue
14	**Color Cycle** DMX value controls cycle speed.	Red	Green	Blue
15	**All or Nothing** If color value > mod value, color = 255, else color = 0	Red	Green	Blue
16	**Solid color RGB**	Red	Green	Blue
17	**RGB Invert**	From Red to Inverted Red	From Green to Inverted Green	From Blue to Inverted Blue

Effect Mode		Adjustments		
DMX Value	**Name/**Definition	**Modifier 1**	**Modifier 2**	**Modifier 3**
18	**RGB, Invert and Swap to GBR**	From Red to Inverted Red	From Green to Inverted Green	From Blue to Inverted Blue
19	**RGB, Invert and Swap to BRG**	From Red to Inverted Red	From Green to Inverted Green	From Blue to Inverted Blue
20	**Edge Detect Color**	Horizontal search size	Vertical search size	Comparison threshold
21	**Edge Detect B/W**	Horizontal search size	Vertical search size	Comparison threshold
22	**Texture Ripple, Horizontal**	Amplitude	Frequency	Phase
23	**Texture Ripple, Vertical**	Amplitude	Frequency	Phase
24	**Texture Ripple, Circular**	Amplitude	Frequency	Phase and Direction
25	**Texture Ripple, Circular Asymmetrical**	Amplitude	Frequency	Phase
26	**Chromakey Fine,** select key color using Modifier channels	Red	Green	Blue
27	**Chromakey Medium,** select key color using Modifier channels	Red	Green	Blue
28	**Chromakey Coarse,** select key color using Modifier channels	Red	Green	Blue
29	**Chromakey Fine, Inverse** select key color using Modifier channels	Red	Green	Blue
30	**Chromakey Medium, Inverse** select key color using Modifier channels	Red	Green	Blue
31	**Chromakey Coarse, Inverse** select key color using Modifier channels	Red	Green	Blue
32	**Scan Line** converts image colors to colors in a single line of the image	Selects scan line	Fades to converted image	Not used
33	**Transparent Wipes** “opens” the selected graphic to reveal another graphic positioned behind it	Area of wipe	Selects center of wipe	Selects from 6 wipe options
34	**Pixel Twist** swirls a portion of the texture	X twist center	Y twist center	Direction and amount of twist
35	**Picture-in-picture** duplicates the texture and overlays it on the original	X subpicture center	X subpicture center	Subpicture size

Effect Mode		Adjustments		
DMX Value	**Name/**Definition	**Modifier 1**	**Modifier 2**	**Modifier 3**
36	**Magnifying Lens** applies spherical overlay that magnifies a portion of the texture	X lens center	Y lens center	Lens size
37	**Magnifying Lens 2** applies spherical overlay that magnifies a portion of the texture.	X lens center	Y lens center	Lens size
38	**Cartoon Edge** creates variable outline around picture elements	Reduces Color	Enhances Contrast	Edge detection sensitivity
39	**Color DeConverge** separates image color components and offsets them from original position	Moves Red component up	Moves Green component down and right	Moves Blue component down and left
40	**Horizontal Mirror** creates a mirror effect	Defines mirror center	Not Used	Not Used
41	**RGB Swap to BGR**	Red to Blue	Green	Blue to Red
42	**RGB Swap to RBG**	Red	Green to Blue	Blue to Green
43	**RGB Swap to GRB**	Red to Green	Green to Red	Blue
44	**Colorize Gray Scale** maps pixel intensity to color	Selects Color Scheme	Selects zero intensity point	Controls fading
45	**Intensity key** turns pixels of selected intensity transparent	Selects Color Scheme	Defines Intensity bandwidth	Controls Transparency
46	**Raindrop** simulates raindrops falling on a liquid surface	Controls size/ speed	seeds random # generator	controls raindrop rate
47	**RGB, Scale** varies color value	Red	Green	Blue
49	**Color to Alpha**	Red to alpha	Green to alpha	Blue to alpha
50	**Color to Alpha, Inverted**	inverted red to alpha	inverted green to alpha	inverted blue to alpha
51	**Texture Mixing**	Selects Source Texture	Selects Source Effect Level	Crossfade Between Textures
128	**Mask Color** applies color to a selected mask shape	Red	Green	Blue
129	**Edge Fade Color** applies color to a selected **Edge Fade** parameter	Red	Green	Blue
130	**Mask Color and Edge Fade Color** applies the same color to both the selected Mask and Image Edge Fade parameters	Red	Green	Blue
131	**Background Color** selects background color	Red	Green	Blue

Effect Mode		Adjustments		
DMX Value	**Name/**Definition	**Modifier 1**	**Modifier 2**	**Modifier 3**
132	**Background Color Cycle** sequences the background color	Red Speed	Green Speed	Blue Speed
134	**Collage Generator** allows a fixture to display a portion of the output to create multi-fixture panorama displays.	Selects Array Type	Selects portion of image to display	Adjusts Edge blending
135	**Curved Surface, Vertical Convex Cylinder** corrects shape projecting on curved surface	Adjusts Correction	Adjusts Vertical Center	Not Used
136	**Curved Surface, Vertical Concave Cylinder** corrects shape projecting on curved surface	Adjusts Correction	Adjusts Vertical Center	Horizontal Center
137	**Curved Surface, Vertical Inside Corner** corrects shape projecting on curved surface	Adjusts Correction	Adjusts Vertical Center	Horizontal Center
138	**Curved Surface, Vertical Outside Corner** corrects shape projecting on curved surface	Adjusts Correction	Adjusts Vertical Center	Horizontal Center
139	**Curved Surface, Sphere** corrects shape projecting on curved surface	Adjusts Correction	Adjusts Vertical Center	Horizontal Center
140	**Curved Surface, Convex Disk** corrects shape projecting on curved surface	Adjusts Correction	Adjusts Vertical Center	Horizontal Center

These options are listed alphabetically with additional detail in *Chapter 11: Effect Mode Options Descriptions* on page 97 .

Global Control

The **Global Control** parameter allows access to different global control modes. How you set the Global control parameter determines the functionality of the **Global Control Modifier** parameter.

Setting this parameter to a DMX value of 255 brings up On-screen programming statistics. In this case, the **Global Control Modifier** parameter controls the text color.

Four-in-One Control Option

The **Four-in-One** control option maps the media file content of each of the graphics objects and the combined output to a four quadrant grid. This option helps you visualize what the graphics engine is doing.

When the Global Control parameter is set to a DMX value = 253, you can use the **Global Control Modifier** parameter to control the Four-in-One control option. You will be able to observe the Collage and Curved Surface support effects as well as up to 3 effects applied to each graphical object.

Setting a DMX value = 31, 32 or 33 lets you display up to three effects applied to a Graphic Object. These effects are accessed according to rendering heirarchy used by the graphics engine. The following table sets up an example of three graphic objects with **x**'s indicating applied effects.

Effect Hierarchy	Graphic Object 1	Graphic Object 2	Graphic Object 3
Visual Effect	**x**		**x**
Graphic Effect 1		**x**	**x**
Graphic Effect 2	**x**	**x**	**x**

Using the example above, the following table describes the results for Four-in-One control values selected in the Global Control Modifer parameter:

DMX Value	4-in-1 Display	
31	Graphic Object 1 Texture + Visual Effect	Graphic Object 2 Texture + Effect 1
	Graphic Object 3 Texture + Visual Effect	Final Composite Image
32	Graphic Object 1 Texture + Visual Effect + Effect 2	Graphic Object 2 Texture + Effect 1 + Effect 2
	Graphic Object 3 Texture + Visual Effect + Effect 1	Final Composite Image
33	Graphic Object 1 Texture + Visual Effect + Effect 2	Graphic Object 2 Texture + Effect 1 + Effect 2
	Graphic Object 3 Texture + Visual Effect + Effect 1 + Effect 2	Final Composite Image

On-Screen Frame Statistics

When the Global Control parameter is set at a DMX Value of 255, the Global Control Modifier channel lets you choose the text color that will best display over your selected image:

DMX Value	Color
1	Gray
2	Red
3	Blue
4	Green

Masking Control

Mask Shape Select and Strobing

The **Mask Select** parameter lets you choose a mask to frame or overlay a composite image. You can choose to apply a mask to an image when you don't want an entire image to be seen or you want to transition from an image to black or a solid color without fading intensity.

Mask Shapes

The DL.2 graphics engine currently provides 30 mask shapes including circular, rectangular, and oval masks that close from inside out or outside in. Checker Board, Radial Wipes, and Multi-panel options are also included with several variations.

Default DMX Value: 0 = Round "iris" mask closing from outside in.

DMX values 0-127 (0-50%) are reserved for static mask shapes. Values of 128-255 (51-100%) are reserved for strobing Mask shapes. Values not yet implemented default to 128.

Strobing Mask Shapes

A strobing version of each simple mask shape is defined in the 128-255 (51-100%) DMX value range.

When a strobing mask is selected, the strobe rate is controlled by the **Mask Edge Fade** parameter from the slowest = 0 to the fastest = 255 (100%).

DMX value	Strobe DMX Value	Mask Shapes
0	128	Round "iris" mask closing from outside in
1	129	Round *iris* closing from inside out
2	130	Rectangle closing from outside in
3	131	Rectangle closing from inside out
4	132	Checkerboard, variation 1
5	133	Checkerboard, variation 2
6	134	Radial wipe, variation 1
7	135	Radial wipe, variation 2
8	136	Radial wipe, variation 3
9	137	Radial wipe, variation 4
10	138	Triangles, variation 1
11	139	Triangles, variation 2
12	140	Rectangular wrap
13	141	Tiles closing in
14	142	Horizontal doors, closing
15	143	Horizontal doors closing from opposing sides
16	144	Vertical doors closing from outside in
17	145	Vertical wipe closing from inside out
18	146	Rectangular tiles closing from inside out 1
19	147	Rectangular tiles closing from inside out 2
20	148	Vertical panels closing from outside in 1
21	149	Vertical panels closing from outside in 2
22	150	Vertical diamonds 1
23	151	Vertical diamonds 2
24	152	Horizontal diamonds 1
25	153	Horizontal diamonds 2
26	154	Pinwheel
27	155	Oval Iris closing from outside in
28	156	Oval Iris closing from inside out
29	157	Oscillating iris closing from outside in
30	158	Animated dynamic Iris

***Note:** A Global Effect Mode parameter option lets you define a Mask color, (see* **Global Effect Mode 1 and Effect Mode 2** *on page 82, and on page 139).*

Mask Size

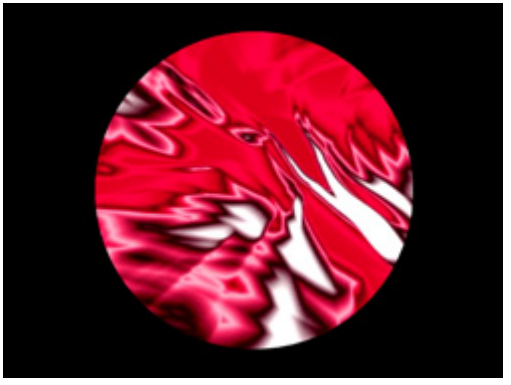
The Mask Size parameter defines mask size for all mask shapes.

Default DMX Value: 255 (100%) = no masking effect

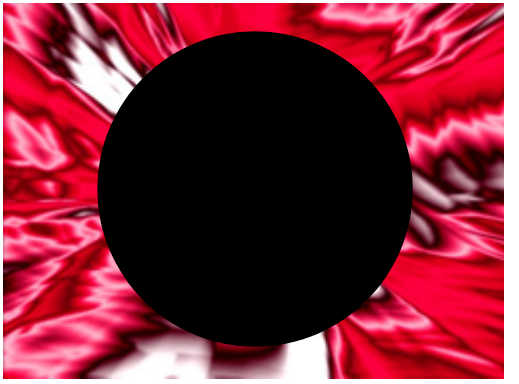
When this parameter is set at a value of 255 (100%), the mask is sized to leave the image 100% visible. When Mask Size is set at 0, the mask totally covers the composite image.

Tip: Crossfading the Mask Size parameter can create unique fades to and from video black.

Mask Select DMX value = 0
Mask Size DMX value = 255 (100%)



Mask Select value of 0
Mask Size DMX value = 128 (50%)



Mask Select DMX value = 1
Mask Size DMX value = 126 (50%)

Mask Edge Fade

The **Mask Edge Fade** parameter diffuses the edge of your chosen mask.

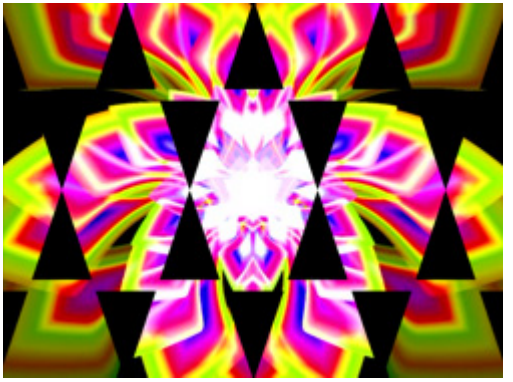
Default DMX Value: 0 = no edge fade applied to mask

Adjust the amount of edge fade from 1 = no edge fade to 255 = maximum edge fade.

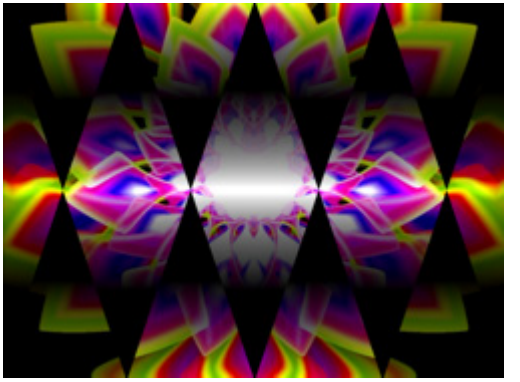
When a Mask Select parameter value of

Note: A Global Effect Mode parameter option lets you define a Mask Edge Fade color on page 105.

Original Image



Mask applied without Edge Fade



Mask with Edge Fade applied

Image Edge Fade

Four **Image Edge Fade** parameters let you control the Edge Fade for individual sides of your object (top, bottom, left and right). When projecting abutting images, adjusting the Edge Fade parameter lets you smooth the line between two images and also allows you to change an object's boundary.

Default DMX Value: 0 = all edges are sharp and hard.

Adjust each side separately for edge fade from 0 = no fade to 255 (100%) = opaque.

Original Content

100% Top Edge Fade

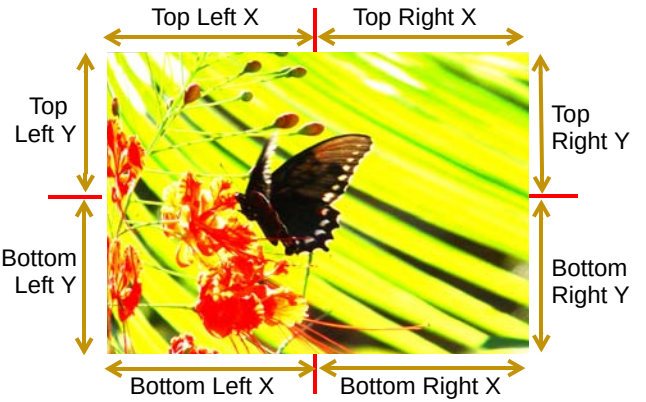
100% Left Edge Fade

100% Top, Bottom, Left, Right Edge Fade

Keystone Correction Parameters

When an image is output from a DL.2 fixture at an angle the image may appear skewed. Eight **Keystone** parameters adjust the image shape and compensate for this effect. You can control each of the four corners of the graphics output to reshape your image to a form that projects correctly.

Default DMX Value: 0 = no keystone correction has been applied

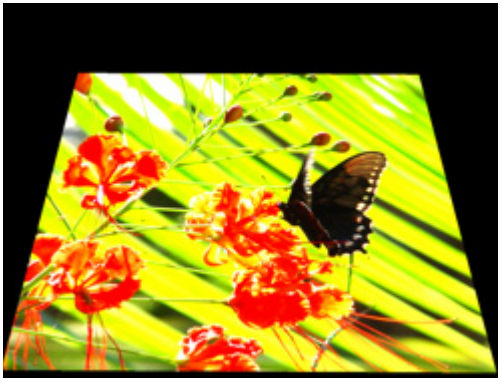


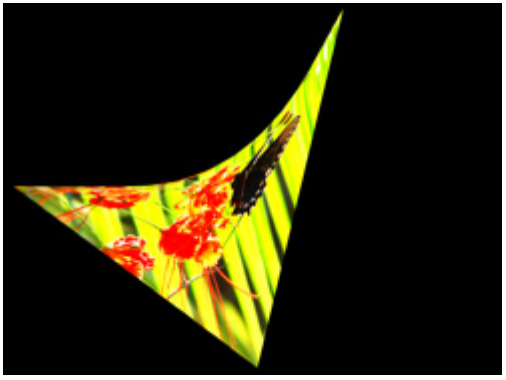
Original Content

Each corner has an x and a y value that adjust and correct scale of the projection from any corner toward the image center on that axis.

Setting all **Keystone X** and **Y** parameters DMX values to zero will place the four corners of the image at the four corners of the projector output. Adjusting keystone x values toward 255 (100%) moves the respective corner x positions horizontally toward the center of that image edge. Adjusting keystone y values toward 255 (100%) causes the respective corner y positions to be moved vertically toward the center of that edge of the image.

Tip: These parameters can also be used to create interesting skewing as a design effect.


Keystone Top Left X DMX value = 85
Keystone Top Left Y DMX value = 85
Keystone Top Right X DMX value = 85
Keystone Top Right Y DMX value = 85

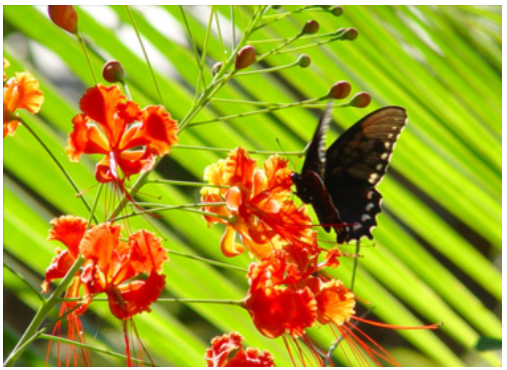

Keystone Top Right Y DMX value = 170
All other Keystone parameter DMX values = 25

X Ratio

The X Ratio Parameter shapes the output to adjust for keystone effects created in certain output situations. This parameter adjusts the output by compressing or expanding the image horizontally.

Default DMX Value: 128 (50%) = no adjustment

DMX value settings below the midpoint of the range compress the image horizontally from maximum compression at a value of 0 to no compression at a value of 128. DMX value settings above the midpoint of the range expand the image horizontally from no expansion at a value of 128 to maximum expansion at a value of 255.



Original media file

X Ratio DMX value = 255 (100%)

Y Ratio

The **Y Ratio** parameter shapes the output to adjust for keystone effects created in certain output situations. This parameter adjusts the output by compressing or expanding the image vertically.

Default DMX Value: 128 (50%) = no adjustment

DMX value settings below the midpoint of the range compress the image vertically from maximum compression at a value of 0 to no compression at a value of 128.

Y Ratio DMX value = 255 (100%)

DMX value settings above the midpoint of the range expands the image vertically from no expansion at a value of 128 to maximum expansion at a value of 255.

Global Viewpoint Mode

The **Global Viewpoint Mode** parameter defines a 3-D space and the **Viewpoint Position** parameters modify your *viewing location* with the defined 3-D space. Each Viewpoint Mode uses three values to specify a viewpoint in space. This point in space is specified by the horizontal angle, vertical angle, and zoom.

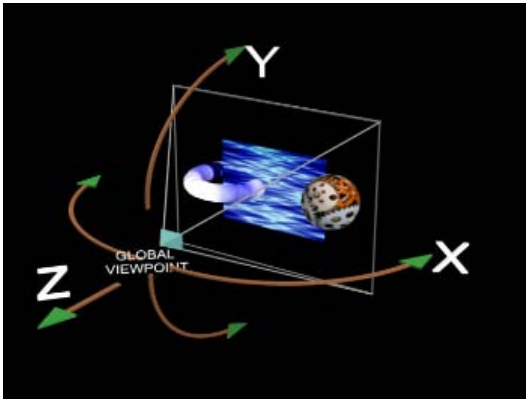
Within any 3-D space, you can choose the viewpoint target as:

- Center of 3-D space
- Center of Object 1
- Center of Object 2
- Center of Object 3

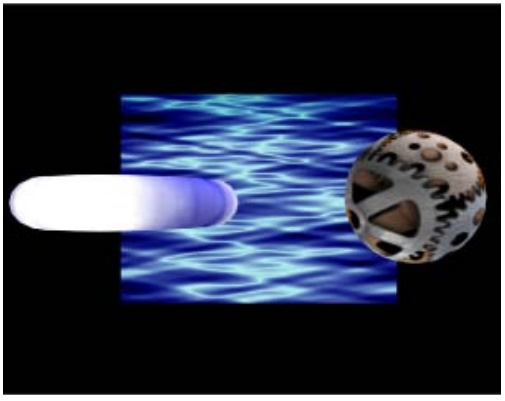
Default DMX Value: 0 = Perspective view, Spherical Coordinates with the focus at the center of the 3-D space.

Perspective View, Spherical Coordinates

This Viewpoint mode creates a 3-D space with a perspective view of a 3-D space. Viewpoints are located in terms of X, Y and Z positions located on a sphere surrounding the image.



Global Viewpoint set with X, Y, and Z positions all equal to zero.



DL.2 output displayed with global viewpoint shown at left.

Perspective View, Cartesian Coordinates

This Viewpoint mode parameter creates a 3-D space with a perspective view. Viewpoints are located in terms of rectangular X, Y and Z positions describing a location in this space.

Orthogonal View, Cartesian Coordinates

This Viewpoint mode creates a 3-D space without perspective. Viewpoint are located in terms of rectangular X, Y and Z positions describing a location in this space. In this case, the composite image is always flat.

Viewpoint Position X

The **Viewpoint Position X** parameter determines the x component of the viewpoint position to the target you have specified in the Viewpoint Mode parameter. The horizontal angle is the angle around the vertical (y) axis. Heading is another name for this angle.

Default DMX Value: 32768 = center

DMX values above center of the range move counterclockwise to the maximum horizontal angle at a value of 65535 (100%). DMX values below the center move clockwise to the minimum horizontal angle at a value of 0.

Viewpoint Position Y

The **Viewpoint Position Y** parameter sets the vertical angle above/below the horizontal plane. Pitch is another name for this component of the viewpoint position.

Default DMX Value: 32768 = center

DMX values above the center of the range move counterclockwise to the maximum vertical angle at a value of 65535 (100%). DMX values below the center move clockwise to the minimum vertical angle at a value of 0.

Viewpoint Position Z (Zoom)

The **Viewpoint Position Z (Zoom)** parameter is the distance from the view target. Zooming toward the target, you can move through it and view it from the back side creating an mirror image view of the composite object.

Default DMX Value: 30260 = center (This default value is slightly less than midway through the range to maintain some depth to the view of a composite image.)

DMX values above center move toward the maximum distance from origin in back of view target (a DMX value of 65535). DMX values below center move toward the maximum distance from origin in front of view target at a value of zero.

Chapter II:

Effect Mode Options Descriptions

Effects can be applied to the Media File content (texture) mapped onto a 3-D object. Multiple Color and Geometric options are available in Effect Mode Parameters for both individual Graphic object and Global control.

Most of the effect options you will find described in this chapter are available for **Effects 1** and **Effect 2** parameters at both the graphic control level for each Graphic Object as well as the Global control level for the composite image. The following pages describe all the Effect Mode options available along with a description of how each Modifier parameter functions with that mode selected.

Check boxes in the upper right hand corner indicate whether this mode is available as a Graphic Object Effect, a Global Effect or both.

☑ Object Effect ☑ Global Effect

Because the options for **Effect 1 Mode** and **Effect 2 Mode** are identical, you can apply up to two options at the graphic level and another two options at the global level. This lets you choose, for example, whether to apply a color effect option to an individual object or to the composite image at the global level.

After you select a mode using either a Graphic Object Effect Mode or a Global Effect Mode parameter, you can use the three associated Modifier parameters to adjust the effect. The behavior of the Modifier parameters depends upon the selected effect.

- For a general information on Graphics Control features, see *Graphics Engine Overview* on page 39.
- For a table of graphic level Effects parameter options, see *Effect 1 and Effect 2* on page 76.
- For a table of global level Effects parameter options, see *Global Effect Mode 1 and Effect Mode 2* on page 82.

Color Conversion: Both Object and Global Effect parameters include options for swapping colors to provide quick color conversions. Use the following DMX Values in any of the Effect parameters to make these color conversions.

DMX Value	Conversion Effect		
7	Red → Green	Green → Blue	Blue → Red
8	Red → Blue	Green → Red	Blue → Green
17	Red → Cyan	Green → Magenta	Blue → Yellow
18	Red → Magenta	Green → Yellow	Blue → Cyan
19	Red → Yellow	Green → Cyan	Blue → Magenta
41	Red → Blue	Green → Green	Blue → Red
42	Red → Red	Green → Blue	Blue → Green
43	Red → Green	Green → Red	Blue → Blue

Effect Mode Color Options

All or Nothing

☑ Object Effect ☑ Global Effect

Effect Mode parameter DMX value = 15

This option reduces all color values to full saturation or no color based on comparison to a set threshold. This effect creates an image with fully saturated color.

Modifier 1: Compares the red component of a pixel to the threshold value and converts it to full color if it is greater than the threshold and to black if it is below the threshold.

Modifier 2: Compares the green component of a pixel to the threshold value and converts it to full color if it is greater than the threshold and to black if it is below the threshold.

Modifier 3: Compares the blue component of a pixel to the threshold value and converts it to full color if it is greater than the threshold and to black if it is below the threshold.

Background Color

☐ Object Effect ☑ Global Effect

Effect Mode parameter DMX value = 131

There is a background behind every composite image. You cannot rotate, scale or position the background and it is visible from every viewpoint and position. This option allows you to apply color to the background.

Modifier 1: Defines the red color component from DMX values of 0 = no red to 255 (100%) = maximum red saturation.

Modifier 2: Defines the green color component from DMX values of 0 = no green to 255 (100%) = maximum green saturation.

Modifier 3: Defines the blue color component from DMX values of 0 = no blue to 255 (100%) = maximum blue saturation.

Background Color Cycle

☐ Object Effect ☑ Global Effect

Effect Mode parameter DMX value = 132

There is a background behind every composite image. You cannot rotate, scale or position the background and it is visible from every viewpoint and position. This option allows you to cycle a color sequence on the background controlling the transition speed.

Modifier 1: Defines the red color component speed. A DMX value of 128 (50%) = default cycle speed. DMX Values above the midpoint increase cycle speed in a forward direction to 255 (100%) = fastest change speed. DMX values below the midpoint increase cycle speed in a backward direction to 0 = fastest change speed.

Modifier 2: Defines the green color component speed in the same way as Modifier 1.

Modifier 3: Defines the blue color component speed in the same way as Modifier 1.

Chromakey Coarse

☑ Object Effect ☑ Global Effect

Effect Mode parameter DMX value = 28

A chromakey removes a color (or small color range) from one graphic image to reveal another "behind" it. The removed color becomes transparent. The modifier parameters define the color you want to select as the chromakey in terms of Red, Green and Blue values. The Chromakey Coarse parameter selects a color range ±40% either side of the defined value.

Modifier 1: Defines the red color component from DMX values of 0 = no red to 255 (100%) = maximum red saturation.

Modifier 2: Defines the green color component from DMX values of 0 = no green to 255 (100%) = maximum green saturation.

Modifier 3: Defines the blue color component from DMX values of 0 = no blue to 255 (100%) = maximum blue saturation.

Chromakey Coarse, Inverse

☑ Object Effect ☑ Global Effect

Effect Mode parameter DMX value = 31

A chromakey removes a color (or small color range) from one graphic image to reveal another "behind" it. The removed color becomes transparent. The modifier parameters define the color you want to select as the chromakey in terms of Red, Green and Blue values. The Inverse Chromakey Coarse parameter selects a color range ±40% either side of the defined value and then sets every other color as chromakeyed.

Modifier 1: Defines the red color component from 0 = no red to 255 (100%) = maximum red saturation.

Modifier 2: Defines the green color component from 0 = no green to 255 (100%) = maximum green saturation.

Modifier 3: Defines the blue color component from 0 = no blue to 255 (100%) = maximum blue saturation.

Chromakey Fine

☑ Object Effect ☑ Global Effect

Effect Mode parameter DMX value = 26

A chromakey removes a color (or small color range) from one graphic image to reveal another "behind" it. The removed color becomes transparent. The modifier parameters define the color you want to select as the chromakey in terms of Red, Green and Blue values. The Chromakey Fine parameter selects a color range ±15% either side of the defined value.

Modifier 1: Defines the red color component from 0 = no red to 255 (100%) = maximum red saturation.

Modifier 2: Defines the green color component from 0 = no green to 255 (100%) = maximum green saturation.

Modifier 3: Defines the blue color component from 0 = no blue to 255 (100%) = maximum blue saturation.

Chromakey Fine, Inverse

☑ Object Effect ☑ Global Effect

Effect Mode parameter DMX value = 29

A chromakey removes a color (or small color range) from one graphic image to reveal another "behind" it. The removed color becomes transparent. The modifier parameters define the color you want to select as the chromakey in terms of Red, Green and Blue values. The Inverse Chromakey Fine parameter selects a color range ±15% either side of the defined value and then sets every other color as a chromakey.

Modifier 1: Defines the red color component from 0 = no red to 255 (100%) = maximum red saturation.

Modifier 2: Defines the green color component from 0 = no green to 255 (100%) = maximum green saturation.

Modifier 3: Defines the blue color component from 0 = no blue to 255 (100%) = maximum blue saturation.

Chromakey Medium

☑ Object Effect ☑ Global Effect

Effect Mode parameter DMX value = 27

A chromakey removes a color (or small color range) from one graphic image to reveal another "behind" it. The removed color becomes transparent. The modifier parameters define the color you want to select as the chromakey in terms of Red, Green and Blue values. The Chromakey Medium parameter selects a color range ±25% either side of the defined value.

Modifier 1: Defines the red color component from 0 = no red to 255 (100%) = maximum red saturation.

Modifier 2: Defines the green color component from 0 = no green to 255 (100%) = maximum green saturation.

Modifier 3: Defines the blue color component from 0 = no blue to 255 (100%) = maximum blue saturation.

Chromakey Medium, Inverse

☑ Object Effect ☑ Global Effect

Effect Mode parameter DMX value = 30

A chromakey removes a color (or small color range) from one graphic image to reveal another "behind" it. The removed color becomes transparent. The modifier parameters define the color you want to select as the chromakey in terms of Red, Green and Blue values. The Inverse Chromakey Medium parameter selects a color range ±25% either side of the defined value and then sets every other color as chromakeyed.

Modifier 1: Defines the red color component from 0 = no red to 255 (100%) = maximum red saturation.

Modifier 2: Defines the green color component from 0 = no green to 255 (100%) = maximum green saturation.

Modifier 3: Defines the blue color component from 0 = no blue to 255 (100%) = maximum blue saturation.

CMY

☑ Object Effect ☑ Global Effect

Effect Mode parameter DMX value = 1

This parameter simulates CMY color by inverting RGB color components. Use this parameter when you want to color mix with a CMY color model instead of RGB color model.

Modifier 1: Increases cyan color component from 0 = no adjustment to 255 (100%) = maximum cyan saturation.

Modifier 2: Increases magenta color component from 0 = no adjustment to 255 (100%) = maximum magenta saturation.

Modifier 3: Increases yellow color component from 0 = no adjustment to 255 (100%) = maximum yellow saturation.

CMY Add All Pixels

☑ Object Effect ☑ Global Effect

Effect Mode parameter DMX value = 2

This effect increases color values across all pixels including black pixels.

Modifier 1: Increases cyan color component from 0 = no adjustment to 255 (100%) = maximum cyan saturation.

Modifier 2: Increases magenta color component from 0 = no adjustment to 255 (100%) = maximum magenta saturation.

Modifier 3: Increases yellow color component from 0 = no adjustment to 255 (100%) = maximum yellow saturation.

CMY Add Non-black Pixels

☑ Object Effect ☑ Global Effect

Effect Mode parameter DMX value = 3

This effect increases color values across all pixels except black pixels.

Modifier 1: Increases Cyan color component from 0 = no adjustment to 255 (100%) = maximum red saturation.

Modifier 2: Increases Magenta color component from 0 = no adjustment to 255 (100%) = maximum red saturation.

Modifier 3: Increases Yellow color component from 0 = no adjustment to 255 (100%) = maximum red saturation.

Color Cycle

☑ Object Effect ☑ Global Effect

Effect Mode parameter DMX value = 14

The image's color components cycle through RGB, black, and white. When no Red Green or Blue is added, image fades from full white, to normal image, to black. When RGB/CMY is added the image fades from the RGB value, to the image with color added.

Modifier 1: Increases red color component from 0 = no adjustment to 255 (100%) = maximum red saturation.

Modifier 2: Increases green color component from 0 = no adjustment to 255 (100%) = maximum green saturation.

Modifier 3: Increases blue color component from 0 = no adjustment to 255 (100%) = maximum blue saturation.

Color DeConverge

☑ Object Effect ☑ Global Effect

Effect Mode parameter DMX value = 39

This effect option separates the different color components of an image and offsets them from the original image position.

Modifier 1: Moves the image's red component up from 0= no adjustment to 255 (100%) = maximum distance from original position.

Modifier 2: Moves the image's green component down and right from 0= no adjustment to 255 (100%) = maximum adjustment.

Modifier 3: Moves the image's blue component down and left from 0 = no adjustment to 255 (100%) = maximum blue saturation.

Colorize Gray Scale

☑ Object Effect ☑ Global Effect

Effect Mode parameter DMX value = 44

This option maps a selected pixel intensity to a selected color scheme. A variety of color schemes simulate effects like thermography. This is especially effective effect when applied to input from the internal camera.

Modifier 1: Selects from color schemes along a range of values from 0 – 255.

Modifier 2: Sets the zero point of the color intensity level from 0 = no intensity to 255 (100%) = maximum intensity.

Modifier 3: Fades from original color scheme to new color scheme using selected intensity.

Color to Alpha

☑ Object Effect ☑ Global Effect

Effect Mode parameter DMX value = 49

This parameter varies the transparency level of an image's component color values.

Modifier 1: Increases the red component opacity or intensity from 0 = no adjustment to 255 (100%) = full red opacity (intensity).

Modifier 2: Increases the green component opacity or intensity from 0 = no adjustment to 255 (100%) = full green opacity (intensity).

Modifier 3: Increases the blue component opacity or intensity from 0 = no adjustment to 255 (100%) = full blue opacity (intensity).

Color to Alpha, Inverted

☑ Object Effect ☑ Global Effect

Effect Mode parameter DMX value = 50

This parameter varies the transparency level of the inverse of an image's component color values.

Modifier 1: Increases the inverse red component opacity or intensity from 0 = no adjustment to 255 (100%) = full green and blue opacity (intensity).

Modifier 2: Increases the green component opacity or intensity from 0 = no adjustment to 255 (100%) = full red and blue opacity (intensity).

Modifier 3: Increases the blue component opacity or intensity from 0 = no adjustment to 255 (100%) = full red and green opacity (intensity).

DotP and Resample

☑ Object Effect ☑ Global Effect

Effect Mode parameter DMX value = 13

This option applies an algorithm that pixelates, and solarizes the image. It also makes the surface of some 3D objects appear reflective.

Modifier 1: Adjusts algorithm.

Modifier 2: Adjusts algorithm.

Modifier 3: Adjusts algorithm.

Edge Fade Color

☐ Object Effect ☑ Global Effect

Effect Mode parameter DMX value = 129

This option applies color to a selected **Edge Fade** parameter, (see *Image Edge Fade* on page 91)

Modifier 1: Increases red color component from 0 = no adjustment to 255 (100%) = maximum red saturation.

Modifier 2: Increases blue color component from 0 = no adjustment to 255 (100%) = maximum blue saturation.

Modifier 3: Increases green color component from 0 = no adjustment to 255 (100%) = maximum green saturation.

Glow

☑ Object Effect ☐ Global Effect

Effect Mode parameter DMX value = 73

Glow colorizes and creates a glow on the 3-D object separate from the media texture on it. You can apply this option to any 3-D object no matter which media file texture is applied to it. This parameter provides an option to view a 3-D object without displaying the associated texture.

Modifier 1: Increases red color component from 0 = no adjustment to 255 (100%) = maximum red saturation.

Modifier 2: Increases blue color component from 0 = no adjustment to 255 (100%) = maximum blue saturation.

Modifier 3: Increases green color component from 0 = no adjustment to 255 (100%) = maximum green saturation.

Glow Color Cycle

☑ Object Effect ☐ Global Effect

Effect Mode parameter DMX value = 74

Glow colorizes and creates a glow on the 3-D object separate from the media texture on it. You can apply this option to any 3-D object no matter which media file texture is applied to it. This parameter provides an option to view a 3-D object without an associated texture.

Modifier 1: Defines the red color component speed. A DMX value of 128 (50%) = default cycle speed. DMX Values above the midpoint increase cycle speed in a forward direction to 255 (100%) = fastest change speed. DMX values below the midpoint increase cycle speed in a backward direction to 0 = fastest change speed.

Modifier 2: Defines the green color component speed in the same way as Modifier 1.

Modifier 3: Defines the blue color component speed in the same way as Modifier 1.

Intensity Key

☑ Object Effect ☑ Global Effect

Effect Mode parameter DMX value = 45

This option turns pixels of a selected intensity transparent or applies the reverse effect.

Modifier 1: Selects intensity from a DMX value of 0 = no intensity to 255 (100%) = full intensity.

Modifier 2: Selects intensity bandwidth from a DMX value of 0 = narrowest bandwidth to 255 = widest bandwidth.

Modifier 3: Turns selected intensity range transparent from 0 = no change to 128 = fully transparent. DMX values above the midpoint of the range change all intensities outside of the selected range transparent from 129 = no transparency to 255 = full reverse transparency.

Mask Color

☐ Object Effect ☑ Global Effect

Effect Mode parameter DMX value = 128

This option applies color to a selected mask shape

Modifier 1: Increases red color component from 0 = no adjustment to 255 (100%) = maximum red saturation.

Modifier 2: Increases blue color component from 0 = no adjustment to 255 (100%) = maximum blue saturation.

Modifier 3: Increases green color component from 0 = no adjustment to 255 (100%) = maximum green saturation.

Mask Color and Edge Fade Color

☐ Object Effect ☑ Global Effect

Effect Mode parameter DMX value = 130

This option applies a color to both the selected Mask shape and any selected Edge parameter. Color can also be applied to Mask shape (see *Picture in Picture* on page 117) and Edge parameter(s) separately.

Modifier 1: Increases red color component from 0 = no adjustment to 255 (100%) = maximum red saturation.

Modifier 2: Increases blue color component from 0 = no adjustment to 255 (100%) = maximum blue saturation.

Modifier 3: Increases green color component from 0 = no adjustment to 255 (100%) = maximum green saturation.

RGB Add, All Pixels

☑ Object Effect ☑ Global Effect

Effect Mode parameter DMX value = 4

This option adds color to all pixels including black using the RGB color model.

Modifier 1: Increases red color component from 0 = no adjustment to 255 (100%) = maximum red saturation.

Modifier 2: Increases blue color component from 0 = no adjustment to 255 (100%) = maximum blue saturation.

Modifier 3: Increases green color component from 0 = no adjustment to 255 (100%) = maximum green saturation.

RGB Add2, All Pixels

☑ Object Effect ☑ Global Effect

Effect Mode parameter DMX value = 5

This option adds color to all pixels including black using the RGB color model.

Modifier 1: Increases red color component from 0 = no adjustment to 255 (100%) = maximum red saturation.

Modifier 2: Increases blue color component from 0 = no adjustment to 255 (100%)= maximum blue saturation.

Modifier 3: Increases green color component from 0 = no adjustment to 255 (100%) = maximum green saturation.

RGB Add to Non-black Pixels

☑ Object Effect ☑ Global Effect

Effect Mode parameter DMX value = 6

This option adds color to all pixels except black using the RGB color model.

Modifier 1: Increases red color component from 0 = no adjustment to 255 (100%) = maximum red saturation.

Modifier 2: Increases blue color component from 0 = no adjustment to 255 (100%) = maximum blue saturation.

Modifier 3: Increases green color component from 0 = no adjustment to 255 (100%) = maximum green saturation.

RGB Invert

☑ Object Effect ☑ Global Effect

Effect Mode parameter DMX value = 17

This option inverts color values to transition the image from an RGB to a CMY color model.

Modifier 1: Transitions the red component from no adjustment at a value of 0 to cyan at a value of 255 (100%)

Modifier 2: Transitions the green component from no adjustment at a value of 0 to magenta at a value of 255 (100%)

Modifier 3: Transitions the blue component from no adjustment at a value of 0 to yellow at a value of 255 (100%)

RGB Invert and Swap to BRG

☑ Object Effect ☑ Global Effect

Effect Mode parameter DMX value = 19

This option swaps the color values from RGB to an inverted BRG color model.

Modifier 1: Transitions the red component from no adjustment at a value of 0 to yellow at a value of 255 (100%)

Modifier 2: Transitions the green component from no adjustment at a value of 0 to cyan at a value of 255 (100%)

Modifier 3: Transitions the blue component from no adjustment at a value of 0 to magenta at a value of 255 (100%)

RGB Invert and Swap to GBR

☑ Object Effect ☑ Global Effect

Effect Mode parameter DMX value = 18

This option swaps the color values from RGB to an inverted GBR color model.

Modifier 1: Transitions the red component from no adjustment at a value of 0 to magenta at a value of 255 (100%)

Modifier 2: Transitions the green component from no adjustment at a value of 0 to yellow at a value of 255 (100%)

Modifier 3: Transitions the blue component from no adjustment at a value of 0 to cyan at a value of 255 (100%)

RGB Scale

☑ Object Effect ☑ Global Effect

Effect Mode parameter DMX value = 47

Reduce and increase color components in the image as a part of the overall color range.
Note: the maximum of Mod1, Mod2 and Mod3 sets overall color range.

Modifier 1: Scales Red in the Media file. A DMX Value of 128 = no adjustment. DMX values below 128 (50%) reduce color value. DMX values over 128 increase color value.

Modifier 2: Scales Green in the Media file. A DMX Value of 128 = no adjustment. DMX values below 128 (50%) reduce color value. DMX values over 128 increase color value.

Modifier 3: Scales Blue in the Media file. A DMX Value of 128 = no adjustment. DMX values below 128 (50%) reduce color value. DMX values over 128 increase color value.

RGB Swap to BGR

☑ Object Effect ☑ Global Effect

Effect Mode parameter DMX value = 41

This option allows you to swap colors. All red values become green and all blue values become red. Green values are unaffected.

Modifier 1: Transitions red color component to blue from 0 = no color change to 255 (100%) = green

Modifier 2: No change to green color component

Modifier 3: Transitions blue color component to green from 0 = no color change to 255 (100%) = red

RGB Swap to BRG

☑ Object Effect ☑ Global Effect

Effect Mode parameter DMX value = 8

This option allows you to swap colors. All red values become blue, all green values become red and all blue values become green.

Modifier 1: Transitions red color component to blue from 0 = no color change to 255 (100%) = blue

Modifier 2: Transitions green color component to red from 0 = no color change to 255 (100%) = red

Modifier 3: Transitions blue color component to green from 0 = no color change to 255 (100%) = green

RGB Swap to GBR

☑ Object Effect ☑ Global Effect

Effect Mode parameter DMX value = 7

This option allows you to swap colors. All red values become green, all green values become blue and all blue values become red.

Modifier 1: Transitions red color component to green from 0 = no color change to 255 (100%) = green

Modifier 2: Transitions green color component to blue from 0 = no color change to 255 (100%) = blue

Modifier 3: Transitions blue color component to red from 0 = no color change to 255 (100%) = red

RGB Swap to GRB

☑ Object Effect ☑ Global Effect

Effect Mode parameter DMX value = 43

This option allows you to swap colors. All red values become green and all green values become blue. Blue values are unaffected.

Modifier 1: Transitions red color component to green from 0 = no color change to 255 (100%) = green

Modifier 2: Transitions green color component to red from 0 = no color change to 255 (100%) = blue

Modifier 3: No change to blue color component

RGB Swap to RBG

☑ Object Effect ☑ Global Effect

Effect Mode parameter DMX value = 42

This option allows you to swap colors. All green values become blue and all blue values become green. Red values are unaffected.

Modifier 1: No change to red color component

Modifier 2: Transitions green color component to blue from 0 = no color change to 255 (100%) = blue

Modifier 3: Transitions blue color component to green from 0 = no color change to 255 (100%) = red

Scan Line

☑ Object Effect ☑ Global Effect

Effect Mode parameter DMX value = 32

Maps image color intensities to the colors in a single horizontal line of the selected texture.

Modifier 1: Selects a line of the media file to scan

Modifier 2: Adjusts the mapping transition

Modifier 3: Not used

Solarize 1

☑ Object Effect ☑ Global Effect

Effect Mode parameter DMX value = 9

This effect option remaps colors to a narrow value range and inverts the color below a set threshold. Solarize options can create strong highlights.

Modifier 1: Increases red color component from 0 = no adjustment to 255 (100%) = maximum red saturation. Red color values below the threshold are converted to cyan.

Modifier 2: Increases blue color component from 0 = no adjustment to 255 (100%) = maximum blue saturation. Blue color values below the threshold are converted to magenta.

Modifier 3: Increases green color component from 0 = no adjustment to 255 (100%) = maximum green saturation. Green color values below the threshold are converted to yellow.

Solarize 2

☑ Object Effect ☑ Global Effect

Effect Mode parameter DMX value = 10

This effect option remaps colors to a narrow value range and inverts the color above a set threshold. Solarize options can create strong highlights.

Modifier 1: Increases red color component from 0 = no adjustment to 255 (100%) = maximum red saturation. Red color values above the threshold are converted to cyan.

Modifier 2: Increases blue color component from 0 = no adjustment to 255 (100%) = maximum blue saturation. Blue color values above the threshold are converted to magenta.

Modifier 3: Increases green color component from 0 = no adjustment to 255 (100%) = maximum green saturation. Green color values above the threshold are converted to yellow.

Solarize 3

☑ Object Effect ☑ Global Effect

Effect Mode parameter DMX value = 11

This effect option remaps colors to a narrow value range and eliminates the color below a set threshold. Solarize options can create strong highlights.

Modifier 1: Increases red color component from 0 = no adjustment to 255 (100%) = maximum red saturation. Red color values below the threshold are eliminated.

Modifier 2: Increases blue color component from 0 = no adjustment to 255 (100%) = maximum blue saturation. Blue color values below the threshold are eliminated.

Modifier 3: Increases green color component from 0 = no adjustment to 255 (100%) = maximum green saturation. Green color values below the threshold are eliminated.

Solarize 4

☑ Object Effect ☑ Global Effect

Effect Mode parameter DMX value = 12

This effect option remaps colors to a narrow value range and eliminates color above a set threshold. Solarize options can create strong highlights.

Modifier 1: Increases red color component from 0 = no adjustment to 255 (100%) = maximum red saturation. Red color values above the threshold are eliminated.

Modifier 2: Increases blue color component from 0 = no adjustment to 255 (100%) = maximum blue saturation. Blue color values above the threshold are eliminated.

Modifier 3: Increases green color component from 0 = no adjustment to 255 (100%) = maximum green saturation. Green color values above the threshold are eliminated.

Solid Color RGB

☑ Object Effect ☑ Global Effect

Effect Mode parameter DMX value = 16

Solid Color RGB removes the media file texture and allows you to color mix the 3-D object to one solid color

Modifier 1: Increases red color component from 0 = no adjustment to 255 (100%) = maximum red saturation.

Modifier 2: Increases green color component from 0 = no adjustment to 255 (100%) = maximum green saturation.

Modifier 3: Increases blue color component from 0 = no adjustment to 255 (100%) = maximum blue saturation.

Geometric Effect Options

Cartoon Edge

☑ Object Effect ☑ Global Effect

Effect Mode parameter DMX value = 38

Outlines the edges of image components to create a cartoon effect.

Modifier 1: Adjusts Color reduction from 0= no adjustment to 255 (100%) = maximum adjustment.

Modifier 2: Adjusts contrast enhancement from 0= no adjustment to 255 (100%) = maximum adjustment.

Modifier 3: Adjusts edge detection sensitivity from 0= no adjustment to 255 (100%) = maximum adjustment.

Collage Generator

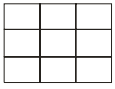
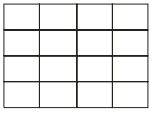
☐ Object Effect ☑ Global Effect

Effect Mode Parameter DMX value = 134

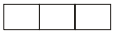
The DL2 collage generator enables multiple DL2 units to create virtually seamless panoramic media projections controlled from a DMX console. You can display either stock or custom content.

The native aspect ratio of one DL.2 fixture's output is 4:3. Some of the arrays configured in conjunction with the collage generator will output a different overall aspect ratio. The following table shows suggested configuration specifications. Array describes the number of DL2 units positioned horizontally by the number of DL.2 fixtures positioned vertically, each displaying their portion of the content. The second set of numbers is the aspect ratio for the overall panorama configuration. Image Resolution is represented as width and height in pixels. The number of DL2 units required is also noted.

Central Panorama Collage

Array Configuration	Array (W x H)	Aspect Ratio	Maximum Recommended Image Resolution (W x H)	DL.2 Units
	2x2	4:3	1024 W x 768 H	4
	3x3	4:3	1024 W x 768 H	9
	4x4	4:3	1024 W x 768 H	16

Horizontal Panorama Collage

Array Configuration	Array (W x H)	Aspect Ratio	Maximum Recommended Image Resolution (W x H)	DL.2 Units
	2x1	8:3	1440 W x 540 H	2
	3x1	4:1	1760 W x 440 H	3
	4x1	16:3	2016 W x 378 H	4

Vertical Panoramas Collage

Array Configuration	Array (W x H)	Aspect Ratio	Maximum Recommended Image Resolution (W x H)	DL.2 Units
	1x2	2:3	720 W x 1080 H	2
	1x3	4:9	576 W x 1296 H	3
	1x4	1:3	496 W x 1488 H	4

Modifier 1: Selects what type of collage array to use.

DMX Value	Array (W x H)	DMX Value	Array (W x H)	DMX Value	Array (W x H)
0	No Collage	6	3 x 2	12	2 x 4
1	2 x 1	7	2 x 3	13	4 x 3
2	1 x 2	8	3 x 3	14	3 x 4
3	2 x 2	9	4 x 1	15	4 x 4
4	3 x 1	10	1 x 4	16-255	Reserved, defaults to no collage
5	1 x 3	11	4 x 2		

Modifier 2: Selects which portion of the grid a particular DL2 will display. DMX values 0-15 step through grid pattern selected by the Modifier 1 parameter. DMX values 16-255 default to the upper left corner of the grid.

Modifier 3: Adjusts edge blending between the selected portion of the image being projected by the fixture and adjacent portions being projected by other fixtures.

DMX Value	Action
0-127	Adjusts the intensity of the blended areas only. This is to have the ability to compensate for any hotspots that may occur in the blended areas.
128-160	Displays the DL.2 output in its cropped state but without edge blending applied.
161-191	Displays the DL.2 output in its cropped state without edge blending but covering the full output of the projector.
192-199	Displays default alignment pattern in rectangular area with no blending.
200-207	Displays default alignment pattern in rectangular area with no blending covering full projector output.
208-223	Displays collage selection grid over default alignment pattern.
224-255	Displays collage selection grid over selected image/movie.

Curved Surface Support

☐ Object Effect ☑ Global Effect

DL-2 Curved Surface Support corrects for shape distortions resulting from projecting onto surfaces that aren't flat. This Global effect option facilitates projecting onto convex or concave cylinders, angular screens, spheres, and disk shaped surfaces. You can apply this correction to any DL.2 output including image Collages.

You can use these adjustments in conjunction with Keystone parameters and Ratio parameters to refine the output shape on any of these surfaces.

You can access the Curved Surface Support for a surface type in the **Global Effects 1** or **Global Effects 2** parameter.

DMX Value	Surface
135	Curved Vertical Convex Cylinder (opening toward projector)
136	Curved Vertical Concave Cylinder (opening away from projector)
137	Vertical Inside Corner (opening toward projector)
138	Vertical Outside Corner (opening away from projector)
139	Sphere
140	Convex Disk (opening away from projector)

After you have selected the surface, the Modifier parameters operate as described below:

Modifier 1 Parameter: Modifier 1 lets you adjust the amount of correction vertically. A value of 0 = no adjustment. The correction increases as you increase value to maximum at 255 (100%).

Modifier 2 Parameter: In situations where you are projecting from any angle other than perpendicular to the surface, you can use Modifier 2 to adjust the vertical center of the image. A DMX value of 128 (50%) = no adjustment. Adjusting toward 0 moves the vertical center down

to the bottom of the image. Values above the midrange move the vertical center up to the top of the image at a DMX value of 255 (100%).

Modifier 3 Parameter: In situations where you are projecting from any angle other than perpendicular to the surface, you can use the Modifier 3 parameter to adjust the image's horizontal center. A DMX value of 128 (50%) = no adjustment. Adjusting toward 0 moves the horizontal center toward the left edge of the image. Values above the midrange move the horizontal center right toward the edge of the image at a DMX value of 255 (100%).

Edge Detect Black and White

☑ Object Effect ☑ Global Effect

Effect Mode parameter DMX value = 21

This option displays only the edges of image components. Edges appear white, everything else is black.

Modifier 1: Adjusts horizontal edge search size from 0= no adjustment to 255 (100%) = maximum adjustment.

Modifier 2: Adjusts vertical edge search size from 0= no adjustment to 255 (100%) = maximum adjustment.

Modifier 3: Adjusts comparison edge threshold from 0= no adjustment to 255 (100%) = maximum adjustment.

Edge Detect Color

☑ Object Effect ☑ Global Effect

Effect Mode parameter DMX value = 20

This option displays only the edges of image components with their color values.

Modifier 1: Adjusts horizontal edge search size from 0= no adjustment to 255 (100%) = maximum adjustment.

Modifier 2: Adjusts vertical edge search size from 0= no adjustment to 255 (100%) = maximum adjustment.

Modifier 3: Adjusts comparison edge threshold from 0= no adjustment to 255 (100%) = maximum adjustment

Horizontal Mirror

☑ Object Effect ☑ Global Effect

Effect Mode parameter DMX value = 40

This option splits the image vertically and mirrors the image alongside it's original.

Modifier 1: The default DMX value of 128 (50%) sets the mirror center point at the center of the screen. Values below the midpoint move the mirror center point toward the left as you approach 0. Values above the midpoint move the mirror center point toward the right as you approach 255 (100%).

Modifier 2: Not Used

Modifier 3: Not Used.

Magnifying Lens

☑ Object Effect ☑ Global Effect

Effect Mode parameter DMX value = 36

This option applies spherical overlay that magnifies a portion of the texture to create a virtual convex lens effect over a portion of the image. You can adjust the size of the lens and *move* it over different areas of the image.

Modifier 1: Controls the horizontal position of the lens' centerpoint from 0=left edge to 255 (100%) = right edge of output.

Modifier 2: Controls the vertical position of the lens' centerpoint from 0=top edge to 255 (100%) = bottom edge of output.

Modifier 3: Controls the size of the lens from 0=smallest to 255 (100%) = largest.

Magnifying Lens 2

☑ Object Effect ☑ Global Effect

Effect Mode parameter DMX value = 37

This option applies spherical overlay that magnifies a portion of the texture to create a doubled virtual convex lens over a portion of the image. You can adjust the size of the lens and *move* it over different areas of the image.

Modifier 1: Controls the horizontal position of the lens' centerpoint from 0=left edge to 255 (100%) = right edge of output.

Modifier 2: Controls the vertical position of the lens' centerpoint from 0=top edge to 255 (100%) = bottom edge of output.

Modifier 3: Controls the size of the lens from 0=smallest to 255 (100%) = largest.

Tip: Zooming in with this lens option creates an additional effect.

Picture in Picture

☑ Object Effect ☑ Global Effect

Effect Mode parameter DMX value = 35

This options creates a window in the image containing a scaled down version of the same image and then lets you position it anywhere on the output plane.

Modifier 1: Controls the horizontal position of the subpicture's centerpoint from 0=left edge to 255 (100%) = right edge of output.

Modifier 2: Controls the vertical position of the subpicture's centerpoint from 0=top edge to 255 (100%) = bottom edge of output.

Modifier 3: Controls the size of the picture from 0=smallest to 255 (100%) = largest.

Pixel Twist

☑ Object Effect ☑ Global Effect

Effect Mode parameter DMX value = 34

This option introduces a twisted area to the image and allows to you size it and move it in the image.

Modifier 1: Controls the horizontal position of the twisted area's centerpoint from 0=left edge to 255 (100%) = right edge of output.

Modifier 2: Controls the vertical position of the twisted area's centerpoint from 0=top edge to 255 (100%) = bottom edge of output.

Modifier 3: Controls the direction and amount of twist. At the midpoint of the range, there is no change in the image. The twist area and size moves counterclockwise from 128 (50%) = smallest area to 0 = largest twist area moving counterclockwise. The twist area and size moves clockwise from 128 (50%) = smallest area to 255 (100%)= largest twist area moving clockwise.

Raindrop

☑ Object Effect ☑ Global Effect

Effects Mode parameter DMX value = 46

This option simulates raindrops falling on a liquid surface.

Modifier 1: Controls the drop size from 0 = no drop to 255 (100%) = maximum size.

Modifier 2: Sets the random number generator seed number. This lets you create a repeatable random sequence that will synchronize correctly when using the collage generator option, see *page 112*.

Modifier 3: Adjusts the raindrop creation rate from 0 = no adjustment to 255 (100%) = maximum rate.

Sinewave, Circular w/X-axis Wobbulation

☑ Object Effect ☐ Global Effect

Effect Mode parameter DMX value = 64

This option varies the boundaries of the underlying object along the x-axis without affecting the media file that is applied as a texture.

Modifier 1: Adjusts the size (amplitude) of the wobble from 0 = no adjustment to 255 (100%) = maximum size.

Modifier 2: Adjusts the rate (frequency) of the wobble from 0 = no adjustment to 255 (100%) = maximum rate

Modifier 3: Adjusts the offset (phase) of the wobble from 0 = no adjustment to 255 (100%) = maximum offset

Sinewave, Circular w/Y-axis Wobbulation

☑ Object Effect ☐ Global Effect

Effect Mode parameter DMX value = 65

This option varies the boundaries of the underlying object along the y-axis without affecting the media file that is applied as a texture.

Modifier 1: Adjusts the size (amplitude) of the wobble from 0 = no adjustment to 255 (100%) = maximum size.

Modifier 2: Adjusts the rate (frequency) of the wobble from 0 = no adjustment to 255 (100%) = maximum rate

Modifier 3: Adjusts the offset (phase) of the wobble from 0 = no adjustment to 255 (100%) = maximum offset

Sinewave, Circular w/Z-axis Wobbulation

☑ Object Effect ☐ Global Effect

Effect Mode parameter DMX value = 66

This option varies the boundaries of the underlying object along the z-axis without affecting the media file that is applied as a texture.

Modifier 1: Adjusts the size (amplitude) of the wobble from 0 = no adjustment to 255 (100%) = maximum size.

Modifier 2: Adjusts the rate (frequency) of the wobble from 0 = no adjustment to 255 (100%) = maximum rate

Modifier 3: Adjusts the offset (phase) of the wobble from 0 = no adjustment to 255 (100%) = maximum offset

Sinewave, Horizontal w/X-axis Wobbulation ☑ Object Effect ☐ Global Effect

Effect Mode parameter DMX value = 67

This option varies the boundaries of the underlying object along the x-axis without affecting the media file that is applied as a texture.

Modifier 1: Adjusts the size (amplitude) of the wobble from 0 = no adjustment to 255 (100%) = maximum size.

Modifier 2: Adjusts the rate (frequency) of the wobble from 0 = no adjustment to 255 (100%) = maximum rate

Modifier 3: Adjusts the offset (phase) of the wobble from 0 = no adjustment to 255 (100%) = maximum offset

Sinewave, Horizontal w/Y-axis Wobbulation ☑ Object Effect ☐ Global Effect

Effect Mode parameter DMX value = 68

This option varies the boundaries of the underlying object along the y-axis without affecting the media file that is applied as a texture.

Modifier 1: Adjusts the size (amplitude) of the wobble from 0 = no adjustment to 255 (100%) = maximum size.

Modifier 2: Adjusts the rate (frequency) of the wobble from 0 = no adjustment to 255 (100%) = maximum rate

Modifier 3: Adjusts the offset (phase) of the wobble from 0 = no adjustment to 255 (100%) = maximum offset

Sinewave, Horizontal w/Z-axis Wobbulation ☑ Object Effect ☐ Global Effect

Effect Mode parameter DMX value = 69

This option varies the boundaries of the underlying object along the z-axis without affecting the media file that is applied as a texture.

Modifier 1: Adjusts the size (amplitude) of the wobble from 0 = no adjustment to 255 (100%) = maximum size.

Modifier 2: Adjusts the rate (frequency) of the wobble from 0 = no adjustment to 255 (100%) = maximum rate

Modifier 3: Adjusts the offset (phase) of the wobble from 0 = no adjustment to 255 (100%) = maximum offset

Sinewave, Vertical w/X-axis Wobbulation

☑ Object Effect ☐ Global Effect

Effect Mode parameter DMX value = 70

This option varies the boundaries of the underlying object along the x-axis without affecting the media file that is applied as a texture.

Modifier 1: Adjusts the size (amplitude) of the wobble from 0 = no adjustment to 255 (100%) = maximum size.

Modifier 2: Adjusts the rate (frequency) of the wobble from 0 = no adjustment to 255 (100%) = maximum rate

Modifier 3: Adjusts the offset (phase) of the wobble from 0 = no adjustment to 255 (100%) = maximum offset

Sinewave, Vertical w/Y-axis Wobbulation

☑ Object Effect ☐ Global Effect

Effect Mode parameter DMX value = 71

This option varies the boundaries of the underlying object along the y-axis without affecting the media file that is applied as a texture.

Modifier 1: Adjusts the size (amplitude) of the wobble from 0 = no adjustment to 255 (100%) = maximum size.

Modifier 2: Adjusts the rate (frequency) of the wobble from 0 = no adjustment to 255 (100%) = maximum rate

Modifier 3: Adjusts the offset (phase) of the wobble from 0 = no adjustment to 255 (100%) = maximum offset

Sinewave, Vertical w/Z-axis Wobbulation

☑ Object Effect ☐ Global Effect

Effect Mode parameter DMX value = 72

This option varies the boundaries of the underlying object along the z-axis without affecting the media file that is applied as a texture.

Modifier 1: Adjusts the size (amplitude) of the wobble from 0 = no adjustment to 255 (100%) = maximum size.

Modifier 2: Adjusts the rate (frequency) of the wobble from 0 = no adjustment to 255 (100%) = maximum rate

Modifier 3: Adjusts the offset (phase) of the wobble from 0 = no adjustment to 255 (100%) = maximum offset

Texture Mixing

☑ Object Effect ☑ Global Effect

Effect Mode parameter DMX value = 51

Texture Mixing lets you crossfade from textures (media file content) of one Graphic Object to the texture of another Graphic Object.

Modifier 1: Selects the Source file for the texture you want to pull. A DMX value = 1 selects Graphic Object 1's media file content. A DMX value = 2 selects Graphic Object 2's media file content. A DMX value =3 selects Graphic Object 3's media file content.

Modifier 2: Selects the effect level you want to use for the source file. A DMX value = 1 select's the first effect applied.

Modifier 3: Adjusts Graphic Object opacity of the source texture from a DMX value of 0 = fully transparent to 255 (100%) = fully opaque.

TIP: You can create a modified Trails effect with the Texture Mixing option using the following steps:

1. Select two Graphic Objects. The second object can be a solid black screen (Media Folder 1, Media File 1)
2. Use Modifier 1 to select the Graphic Object you want to display with a trail effect.
3. Set Modifier 2 to a DMX Value = 2
4. Set Modifer 3 in a range between a DMX value of 240-254. The closer to 254, the more exagerated the trail effect appears. If Modifier 3 is set to 255, the output will appear to stall or freeze on an image

Texture Ripple, Asymmetrical Circular

☑ Object Effect ☑ Global Effect

Effect Mode parameter DMX value = 25

This option varies the distance of reference points to the applied media file texture around the z-axis without affecting the underlying object to create an effect of wavy ripples moving out from the object's center.

Modifier 1: Adjusts the size (amplitude) of the ripple from 0 = no adjustment to 255 (100%) = maximum size.

Modifier 2: Adjusts the rate (frequency) of the ripple from 0 = no adjustment to 255 (100%) = maximum rate

Modifier 3: Adjusts the offset (phase) speed and direction. A DMX value of 128 (50%) = no adjustment. DMX Values above the midpoint increase speed in a forward direction to 255 (100%) = fastest speed. DMX values below the midpoint increase speed in a backward direction from no adjustment to 0 = fastest speed.

Texture Ripple, Circular

☑ Object Effect ☑ Global Effect

Effect Mode parameter DMX value = 24

Varies the distance of reference points to the applied media file texture around the z-axis without affecting the underlying object. This creates an effect of concentric rippling out from the object center.

Modifier 1: Adjusts the size (amplitude) of the ripple from 0 = no adjustment to 255 (100%) = maximum size.

Modifier 2: Adjusts the rate (frequency) of the ripple from 0 = no adjustment to 255 (100%) = maximum rate

Modifier 3: Adjusts the offset (phase) speed and direction. A DMX value of 128 (50%) = no adjustment. DMX Values above the midpoint increase speed in a forward direction to 255 (100%) = fastest speed. DMX values below the midpoint increase speed in a backward direction from no adjustment to 0 = fastest speed.

Texture Ripple, Horizontal

☑ Object Effect ☑ Global Effect

Effect Mode parameter DMX value = 22

Varies the distance of reference points to the applied media file texture around the x-axis without affecting the underlying object.

Modifier 1: Adjusts the size (amplitude) of the ripple from 0 = no adjustment to 255 (100%) = maximum size.

Modifier 2: Adjusts the rate (frequency) of the ripple from 0 = no adjustment to 255 (100%) = maximum rate.

Modifier 3: Adjusts the offset (phase) speed and direction. A DMX value of 128 (50%) = no adjustment. DMX Values above the midpoint increase speed in a forward direction to 255 (100%) = fastest speed. DMX values below the midpoint increase speed in a backward direction from no adjustment to 0 = fastest speed.

Texture Ripple, Vertical

☑ Object Effect ☑ Global Effect

Effect Mode parameter DMX value = 23

Varies the distance of reference points to the applied media file texture around the y-axis without affecting the underlying object.

Modifier 1: Adjusts the size (amplitude) of the ripple from 0 = no adjustment to 255 (100%) = maximum size.

Modifier 2: Adjusts the rate (frequency) of the ripple from 0 = no adjustment to 255 (100%) = maximum rate

Modifier 3: Adjusts the offset (phase) speed and direction. A DMX value of 128 (50%) = no adjustment. DMX Values above the midpoint increase speed in a forward direction to 255 (100%) = fastest speed. DMX values below the midpoint increase speed in a backward direction from no adjustment to 0 = fastest speed.

Tiling

☑ Object Effect ☐ Global Effect

Effect Mode parameter DMX value = 48

Tiling varies the number of times a media file is applied as a texture to an object. This effect works best on objects that have an undisrupted surface area.

Modifier 1: Adjusts the size and number of tiles along the x axis. A value of 128 (50%) = no adjustment. Values below the midpoint size a single image to 0 = maximum image magnification. Values above the midpoint increase number of images displayed to 255 (100%) = maximum.

Modifier 2: Adjusts the size and number of tiles along the x axis. A value of 128 (50%) = no adjustment. Values below the midpoint size a single image to 0 = maximum image magnification. Values above the midpoint increase number of images displayed to 255 (100%) = maximum.

Modifier 3: Not Used

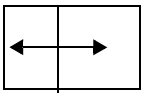
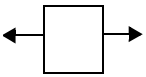
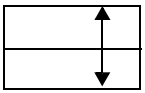
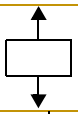
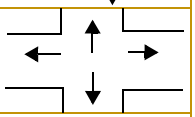
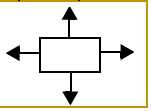
NOTE: The Tiling effect implemented on Effect 1 overrides tiling on Effect 2.

Transparent Wipes

☑ Object Effect ☑ Global Effect

Effect Mode parameter DMX value = 33

Transparent wipes let you open one graphic to reveal another graphic behind it. You can select from six options and the centerline of the effect.

DMX Value	Name/Definition	
1-42	Rectangle wipes from center out horizontally	
43-84	Rectangle wipes from edges out horizontally	
85-126	Wipes from center out vertically	
127-170	Wipes from edges out vertically	
171-212	Cross shape wipes from center out	
212-255	Box shape wipes from edges outward	

Modifier 1: Adjusts the area of the wipe from the smallest at a value of 0 to the largest at a value of 255 (100%).

Modifier 2: Selects the center of a wipe effect's separation

Modifier 3: Selects the wipe option. Each option occupies a portion of the DMX value range.

Chapter 12:
Fixture Motion Functions

This chapter describes mechanical control for the DL.2 fixture with it's internal projector.

Pan and Tilt

The DL.2 fixture has a 400° pan range and a 240° tilt range. Two DMX channels for **Pan** and two for **Tilt** provide 16-bit position adjustment to a fraction of a degree.

MSpeed values can control the timing of pan and tilt motion for DL.2 fixtures, (see *MSpeed (Motor Speed)* on page 128). To control Pan and Tilt movement timing via a DMX controller crossfading, leave the Pan/Tilt MSpeed in it's default Off setting.

Note: The DL.2 fixture uses optical encoders for pan and tilt to instantly correct the fixture's position if the fixture is jarred from its programmed position.

If a physical obstruction prevents the fixture from correcting its position, this correction feature "times out" to prevent wear on the motors.

If the fixture's position correction has timed out, remove the obstruction and home the fixture to return it to normal operation.

Dimmer

The DL.2 fixture has a mechanical iris located in front of the projector output lens that functions as a dimmer for the fixture's output. This feature gives the operator the ability to fully shutter the output and eliminate the residual luminance from video black. The **Dimmer** parameter controls the dimming iris adjustment from closed (DMX value = 0) to fully open (DMX value = 255).

Focus

The **Focus** parameter controls the fixture's mechanical focus from near (DMX value = 0) to far (DMX value = 255).

Zoom

This **Zoom** parameter controls the fixture's mechanical zoom from narrow (DMX value = 0) to wide (DMX value = 255).

MSpeed (Motor Speed)

The **MSpeed** parameter adjusts the time required for a motor to complete movement when changing from one position to another. MSpeed provides a method for all motors to reach their target position at the same time, even though each motor may have different distances to travel. MSpeed movement is extremely smooth because the fixture controls movements independent of DMX refresh rates.

MSpeed times vary from 0.15 seconds to 252.7 seconds. In general, allowing the console to crossfade the pan and tilt values for the DL2 fixture is acceptable. However, extremely slow movements may require the use of Mspeed instead of console crossfades. For a listing of exact MSpeed times, see “Appendix B: MSpeed Conversion Table”.

Control Function Options

The **Control** parameter remotely initiates various fixture operations and allows access to the internal-projector menu controls.

Fixture Operations

All of the following Fixture operation **Control** parameter settings (except for MSpeed Off), require the Dimmer be closed (DMX Value = 0).

DMX Value Range	Control Option Description
10-13	Disables Pan and Tilt MSpeed
20-28	Disables the LCD Display
30-38	Dims the LCD display
40-48	Enables the LCD display
50-58	Enables Preview Mode for the LCD display
60-68	Homes all the fixture mechanical functions
80-88	Manually turns the Lamp ON
90-98	Manually turns the Lamp OFF
120-130	Shuts down the fixture
145-149	Resets the Graphics Engine
150-155	Resets the Camera functions
160-168	Homes only the Pan and Tilt functions
170-178	Homes only the Focus, Zoom, and Dimmer components

Projector Control

Control Parameter Projector Options

These **Control** parameter options remotely access and operate the internal projector's menu system..

DMX Value Range	Control Option Description	
180-184	Displays the Projector's internal Menu System	
185-188	Projector Up arrow	These options control the directional buttons on the projector menu display and cannot be activated until you set the Dimmer parameter to 0.
189-192	Projector Down arrow	
193-196	Projector Left arrow	
197-200	Projector Right arrow	
201-204	Store Menu selection	
	The following options are always active and do not require the dimmer to be at zero	
205-208	Projector Floor Orientation	These commands activate the projector's setting for specific mounting or projection alternatives. Once set, these commands maintain their value until reset even after shutdown and re-homing. For example, if the Control parameter is set to switch the unit to Ceiling orientation, then the unit will remain in Ceiling orientation until another command is sent to switch back to Floor. This allows the Control parameter to revert to another value without losing the orientation or mirroring status.
209-212	Projector Ceiling Orientation	
213-216	Projector Front Projection	
217-220	Projector Rear Projection	
221-224	Input from External RGBHV to Projector	Video input can be utilized with either RGBHV or VGA but not both. You can select between RGBHV and VGA in the menu system, (see *DMX_Control Screen* on page 25). RGBHV is the factory default. Before using DMX to change DL.2 inputs, you must enable the **Projector Input by DMX** option in the menu system (see *Set_Projector Screen* on page 29) or through the CMA (see *Viewing Fixture Configuration Values* on page 152).Once the selection is made, allow about 10 seconds for the change to take effect.
225-228	Graphics Engine to Projector	
229-232	Input from S-Video In (camera to Camera Out) to Graphics Engine	
233-236	Input from Camera to Graphics Engine (default)	

CAUTION:
Do not physically connect both the VGA and the RGBHV connectors at the same time. Doing so can damage the projector and void the warranty.

Using the Internal Projector's Menu

To use the native projector menu system under DMX control:

1. Set the Dimmer parameter DMX value to zero
2. Set the Control parameter DMX value to 182. This will access the projector's main menu.
3. Next, change the DMX value of the Control panel to zero. This command is equivalent to releasing the key on the projector's keypad. *Failure to release the key will result in unpredictable performance.*

   Optional. If the projector is mounted on the ceiling, flip the display by selecting a Control parameter DMX value from 209-212.
4. Set the Dimmer parameter DMX value to 255 (100%) to view the projector menu's on-screen display.
5. Adjust the Zoom and Focus parameters to bring the display into focus. Now the control parameter's *Projector Floor Orientation, Projector Ceiling Orientation, Projector Front Projection and Projector Rear Projection* commands map to the Projector's menu control buttons.
6. Use the projector's on-screen display as discussed in the projector's user manual that shipped with your DL.2 fixture.

Chapter 13:

Live Video Input and Control

The DL.2 graphics engine can receive video from an external source or its own integrated digital video camera equipped with an infared illuminator to provide a direct digital video feed option.

Live Video Sources

Internal Camera

Every DL.2 is equipped with a internal video camera and IR illuminator capable of capturing live video even in blackout conditions.

The camera is mounted on the front of the DL.2 near the projector iris to point wherever the DL.2 fixture is directed.

All of the camera functions can be controlled via a DMX console (see *Controlling the Internal Camera Input* on page 133).

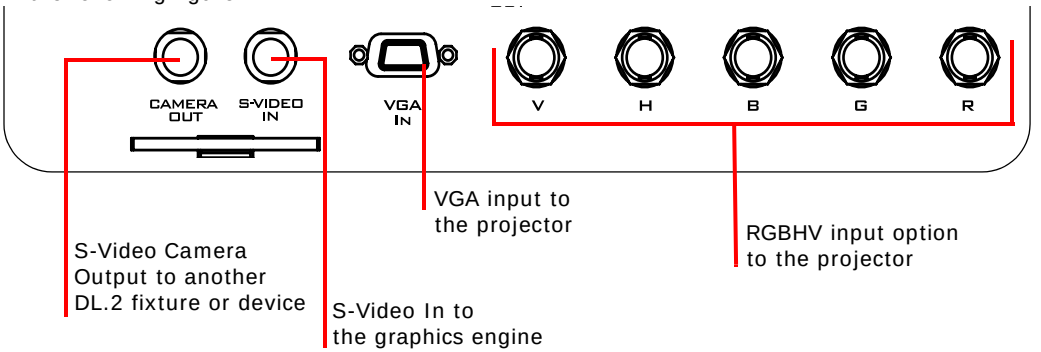
Other Video Sources

A DL.2 fixture can also project other live video sources connected to the DL.2 fixture's RGBHV, VGA, or S-Video input ports. With S-Video input, the live video can be further enhanced and manipulated by the DL.2's graphics engine.

Note: ***You can configure the graphics engine to capture video from an external source or the internal camera but not from both at the same time.***

Live Video Connection Options

The DL.2 fixture has video connectors for RGBHV, VGA and S-Video on its rear panel, as shown in the following figure.



CAUTION:
To avoid damaging the fixture and voiding the warranty, do not physically connect to the RGBHV and VGA inputs at the same time.

Configuring the Video Input Source

DL.2 fixtures support multiple SVideo formats including:

NTSC_M	PAL_B	PAL_H	SECAM_B	SECAM_K
NTSC_MJ	PAL_D	PAL_I	SECAM_D	SECAM_K1
	PAL_G	PAL_M	SECAM_G	SECAM_L
		PAL_N	SECAM_H	SECAM_L1

You will need to configure the DL.2 fixture to identify which video input source you have chosen. The active input can be configured the following ways:

- Manually using the DL.2 menu system (see information about the *Projector Input* field on the *Set_Projector Screen* on page 29.)
- Remotely through the CMA (see *Editing Configuration Values* on page 152)
- Via the DMX console commands (see *Projector Control* on page 129).

NOTE: The integrated cameras provides an NTSC_M video signal.

Sending the Camera Feed to Camera Out

The factory default assigns the video feed from the internal camera to the graphics engine. However, the DL2 fixture can be configured to route the camera video feed to the Camera Out connector by setting the Control Parameter to a DMX value between 229-232.

NOTE: The internal camera video feed can be routed to either the graphic engine or the camera out connector, it can not be applied to both at the same time.

This setting will be retained until you change it or restore the factory defaults.

For more information on configuring and previewing the internal camera feed, see Integrating Live Video and other Media with DL.2 at http://www.highend.com/products/digital_lighting/dl_2.asp

Controlling the Internal Camera Input

Several parameters allow you to control and apply effects to the Internal camera input.

Camera Zoom

The **Camera Zoom** parameter uses two DMX channels to provide 16-bit control of the camera's zoom function. This includes an 18× optical and 12× digital zoom for a total of 216× combined zoom range. You can adjust the Camera Zoom parameter from In (DMX value = 0) to Out (DMX value = 65535)

Camera Focus

The **Camera Focus** parameter uses two DMX channels to provide 16-bit control of the camera's focus function. Auto focus for the camera is active when DMX values = 0–511. The camera focus can also be manually adjusted from In (Far End) DMX value = 512 to Out (Near End) DMX value = 65535.

IR Illuminator

The DL.2 fixture is equipped with an illuminator that can output infrared (IR) light. The **IR Illuminator** parameter controls both the IR illuminator output and the camera's infrared sensing option. DMX values = 0 – 63 turn the illuminator off and set the camera to sense the visible light spectrum. From DMX values = 64–127, the illuminator remains off, but the camera's Auto IR function is ON, detecting ambient infrared light in the environment. The rest of the DMX range turns the Auto adjustment off and adjusts the amount of IR illuminator output from FULL (DMX value = 128) to OFF (DMX value = 255).

Camera Shutter

The DL.2 fixture's internal camera can create slow-motion and choppy-frame effects using the camera shutter options. The **Camera Shutter** parameter controls the camera shutter providing six steps of frame rate control from 1 to 30 frames/second. DMX values = 0 – 63 set Full Auto Exposure and is the suggested default option.

White Balance Mode

The **White Balance Mode** parameter adjusts for variation in what is perceived as "White" in different light conditions. The Auto White Balance mode computes the white balance value output using color information from the entire image. It outputs the proper value using the color temperature on a range of values from 3000 to 7500K and is the suggested default setting. Other settings for this parameter accommodate Indoor and Outdoor lighting conditions.

Orientation

The **Camera Orientation** parameter can Vertically Invert (Flip) or Horizontally Invert (Mirror) the camera's image being viewed by the camera. All four combinations of Vertical and Horizontal Invert are available.

Camera Effects

The **Camera Effects** parameter provides several options for manipulating the camera's image. This parameter provides the ability to convert the camera's image to black and white (B&W), or invert the color (Negative art). A snapshot can also be taken of the camera's image (Freeze Frame) with or without one of these effects applied.

Chapter 14:

Content Management Application (CMA)

A Content Management Application (CMA) running on your workstation or laptop computer gives you remote control of uploading and crossloading content, upgrading software and fixture configuration for multiple DL.2 fixtures on a fixture network.

Overview.

Before you launch the CMA, set up your Ethernet network and link all DL.2 fixtures you want to access from the CMA. See *Linking DL.2 Fixtures* on page 10 for more information on configuring a fixture network.

The CMA communicates with the DL.2 fixture network in three ways:

Web Services: The CMA application physically runs on an end user's machine, but accesses web services to facilitate all aspects of the required CMA functionality.

Discovery Packets: The CMA captures the DL.2 fixture discovery packets to automatically discover the IP Addresses and Fixture IDs of all the DL.2 fixtures on the network.

SMB File Transfers: The cross platform SMB file transfer protocol is used to transfer both Content and upgrade installer files between the CMA and the DL.2 fixture.

Installing the CMA

You can download the latest version of the application for Windows XP or Mac OS 10.4 based system from the Digital Lighting support section of the High End Systems website www.highend.com/support. A download wizard simplifies installation on your personal computer. The following are recommended hardware requirements for the CMA:

- Mac OS 10.4 or Windows XP with Microsoft .NET Framework 1.1 Service Pack 1
- 100/1000 base Ethernet card (a Gigabit Ethernet card is recommended for fast content uploading of large files)

Note: ***When installing the CMA on a laptop, disable the wireless adapter to prevent IP address conflicts that can keep the CMA from recognizing DL.2 fixtures.***

Insert the CD that shipped with your fixture to automatically install the CMA on your harddrive.

NOTE: ***If you are running Windows OS and the CMA doesn't automatically install, navigate to the dl2client.msi file in your windows browser and double click to install the CMA.***

Upgrading CMA Software to a Newer Version

The latest fixture and CMA (client) software is always available at the High End Systems website, (www.highend.com/support). Check the fixture's currently installed software version under the Info tab of the fixture's menu system, (see *Info_Version Screen* on page 32) or through the CMA's ***All Servers*** view, (see *Viewing Server Identification Information* on page 137).

To upgrade the fixture or CMA (client) software, first download the file from the website to your computer. Then use the CMA to upload it to your DL.2 fixtures.

Auto Discovery

When a DL.2 fixture is connected to a network, it sends out “Discovery” messages. These messages are received by other DL.2 fixtures as well as the CMA software. The messages contain information that allows the DL.2 fixtures to communicate with each other, and the CMA to communicate with all the DL.2 fixtures on the network. This information includes the IP Address, Fixture ID, and the DL.2 software version.

Fixtures derive their IP addresses through a router or automatic IP assignment.

Fixture Identification

The Fixture ID is used in the control protocol to identify specific fixtures for sychronization functions.

NOTE: ***To ensure that sychronization works properly, each fixture should be assigned a unique fixture ID.***

The Management Client Window

The CMA application’s Management Client Window uses a simplified Windows Explorer style user interface with views of the content and configuration of all DL.2 servers connected to the ethernet network. You can access options for each view from the drop down menu at the top of the Management Client Window or with a right-click in the right pane.

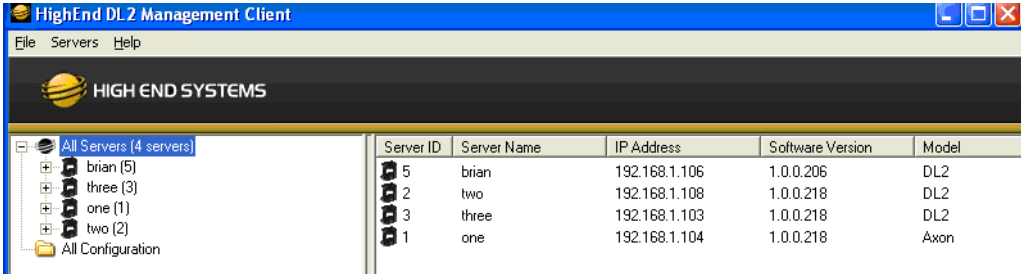
NOTE: ***You cannot drag folders or files between the left and right panes of the CMA window.***

A **Status Bar** at the bottom of the page, indicates the number of files or folders within a selected folder in the left pane, as well as free space on the computer harddrive.

Viewing Server Identification Information

Selecting the **All Server** view displays all the DL.2 servers on the fixture network. In the following example, four servers have been identified on the network. The right pane contains the following details in a table format.

- **Server ID** number defaults to 1, but can be configured in the CMA or in a fixture's Menu system, see *DMX_Control Screen* on page 25.
- **Server Name** is a name you assign to a fixture
- **IP Address** is assigned to that fixture by the router or Auto IP
- **Software Version** Number
- **Model** identifies the fixture type



Note: Clicking in a column heading sorts the table according to the values in that column

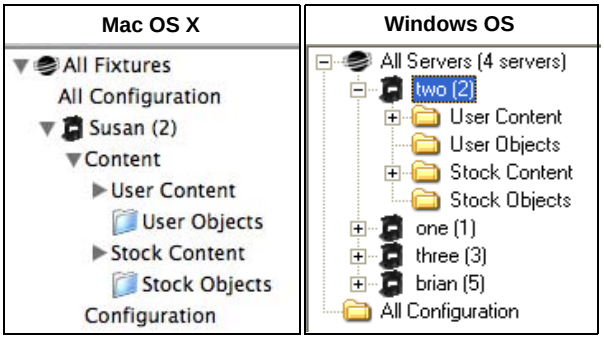
In the **All Server** view, the drop down menu or a right click on a server in the right pane gives you the these options:

- **Refresh** the screen
- **Clone Content** replicates the server's user content to one or more other servers on the network, *(see page 148)*.
- **Delete Content** removes all the user content from the server.
- **Create Content Archive** lets you back up all the server's user content to a compressed file, *(see page 147)*.
- **Deploy Content Archive** restores user content to the server from the backup, *(see page 147)*.
- **Upgrade Software** allows you to upgrade fixture software. For more information on upgrade options, see *Upgrading Software* on page 149.

Client Window Content Organization

The media server on each fixture has a file system that holds the movies, images, and 3-D objects that make up the content that the server uses.

These files, folders, and their DMX values are collectively known as the "Content" on the fixture.



The Client Management Window organizes and identifies content by source (preloaded Stock content or custom User content) and type (Media files or 3D Object files).

NOTE: ***Tree structure differs slightly on the two platform versions. In the Mac Finder, Media files are User Content and Stock Content options, and a configuration option appears under the server. In Windows Explorer, configuration information for the server is located directly by selecting the server.***

Preloaded Stock Content

A large library of Stock Media and Stock Objects ships with every DL.2 fixture and will also be provided through upgrades from High End Systems. This content is read-only. You won't be able to download, edit the DMX values or remove these files from the fixture.

Custom User Content

You can create your own custom User Media and User Objects content, and upload it to fixtures. The Stock Content and User Content reside in separate folders. The High End Systems Digital Lighting Community (forums.highend.com) is a resource for tips and techniques on creating User Content. See *Custom User Content* on page 231 for basic considerations in developing your own content for the DL.2 fixture.

Media Files

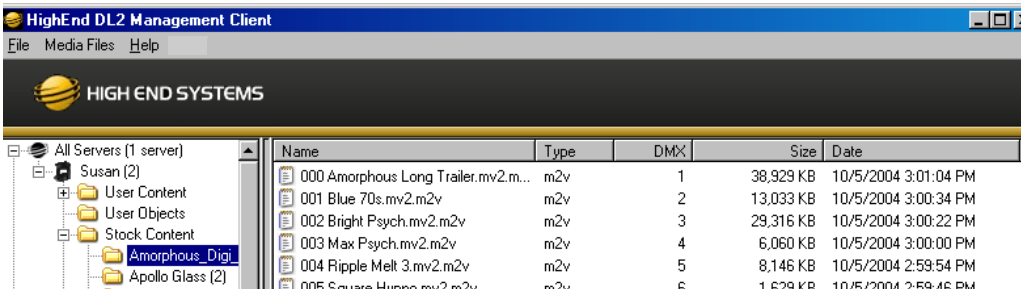
Inside User Image and Stock Image folders are Library folders containing collections of media files. Media files can be still images or video clips in one of the following formats:

.jpg	.gif	.png	.bmp	.mpv	.m1v	.mpg	.m2v

Note: ***DL.2 supports .jpg formatted using RGB color. CMYK color files are not currently supported.***

The stock media files provided by High End Systems have been compressed and optimized for reliable and smooth playback from DL.2 fixtures. Each file and folder has an associated DMX

value. These values are fixed for Stock Content but must be assigned for all user created content. See the *Assigning DMX Values to User Content* on page 141 for more information.


HighEnd DL2 Management Client
File Media Files Help
HIGH END SYSTEMS
All Servers (1 server)
Susan (2)
User Content
User Objects
Stock Content
Amorphous_Digi
Apollo Glass (2)
Name Type DMX Size Date
000 Amorphous Long Trailer.mv2.m... m2v 1 38,929 KB 10/5/2004 3:01:04 PM
001 Blue 70s.mv2.m2v m2v 2 13,033 KB 10/5/2004 3:00:34 PM
002 Bright Psych.mv2.m2v m2v 3 29,316 KB 10/5/2004 3:00:22 PM
003 Max Psych.mv2.m2v m2v 4 6,060 KB 10/5/2004 3:00:00 PM
004 Ripple Melt 3.mv2.m2v m2v 5 8,146 KB 10/5/2004 2:59:54 PM

3D Object Files

Object files are the 3-D object component files used to build a graphic image. DL.2 protocol supports a combined total of 255 object files displayed in Stock Objects and User Objects folders. As with Stock Media files, the Stock Objects have a fixed DMX value and cannot be edited. A User created object file must be assigned a unique DMX value between 150-255.

Viewing Server Configuration Data

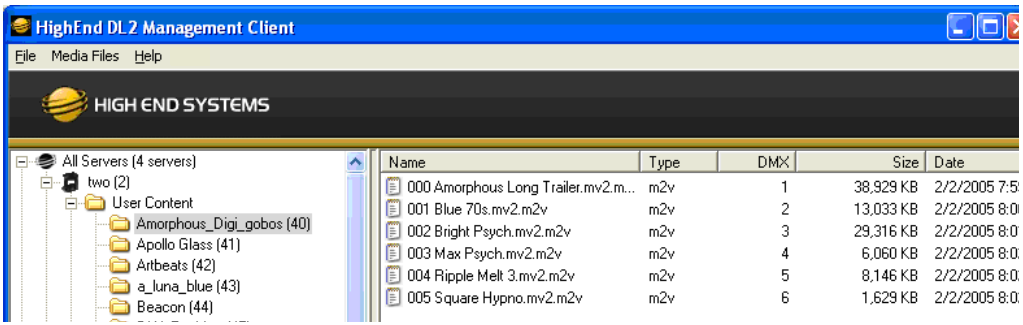
Selecting an individual server from the list in the left pane displays all the configuration values for that server in the right pane. Selecting **All Configuration** displays the combined configuration values for all the servers on the network. For more information on fixture configuration, see *Viewing and Editing Fixture Configuration* on page 151.

Mac OS X: Viewing Server Configuration

To access Server Configuration information for an individual server, select the Configuration option under the individual server.

Viewing Content

When viewing Content, the right pane contains the following information in a table format.


HighEnd DL2 Management Client
File Media Files Help
HIGH END SYSTEMS
All Servers (4 servers)
two (2)
User Content
Amorphous_Digi_gobos (40)
Apollo Glass (41)
Artbeats (42)
a_luna_blue (43)
Beacon (44)
Name Type DMX Size Date
000 Amorphous Long Trailer.mv2.m... m2v 1 38,929 KB 2/2/2005 7:5
001 Blue 70s.mv2.m2v m2v 2 13,033 KB 2/2/2005 8:0
002 Bright Psych.mv2.m2v m2v 3 29,316 KB 2/2/2005 8:0
003 Max Psych.mv2.m2v m2v 4 6,060 KB 2/2/2005 8:0
004 Ripple Melt 3.mv2.m2v m2v 5 8,146 KB 2/2/2005 8:0
005 Square Hypno.mv2.m2v m2v 6 1,629 KB 2/2/2005 8:0

***Note:** Clicking on a column heading sorts the table according to the values in that column.*

Viewing Folders

Each Stock or User Media folder contains a group of media files.

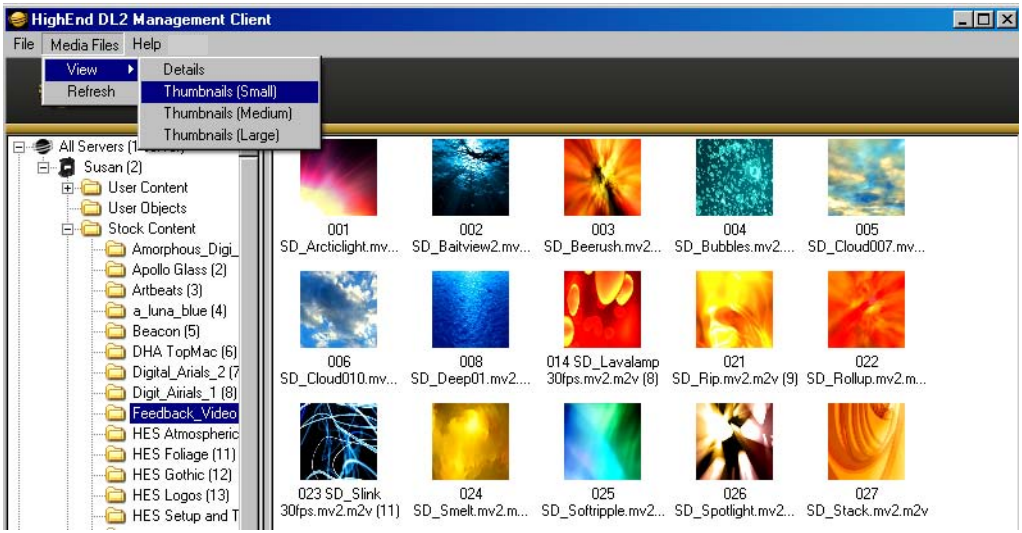
- **Name** of the Media File collection. This value is editable for User content. See *Naming and Deleting User Content Files and Folders* on page 141.
- **DMX** is the currently assigned DMX value for the folder. This value can be auto-assigned and edited for User content. See *Naming and Deleting User Content Files and Folders* on page 141.
- **File Count** of files in this collection
- **Date** the folder was last modified

Viewing Files

Selecting the actual media folder reveals its contents.

- **Name** of the file. This value is editable for User content. See *Naming and Deleting User Content Files and Folders* on page 141.
- **Type** indicates the file format extension
- **DMX** is the currently assigned DMX value for the folder. This value can be auto-assigned and edited for User content. See *Assigning DMX Values to User Content* on page 141.
- **Size** of file in kilobytes
- **Date** the file was last modified.

You can access several options for displaying files in the right pane through the drop down menu or by right clicking in the right pane when files are being displayed.



Managing User Content

All Stock and User content can be viewed and refreshed but the CMA client gives you additional control over other aspects of your custom content. Within the CMA window, you can:

- Rename user files and folders
- Delete files and folders
- Control DMX value assignment to files and folders
- Move files and folders between your local drive and a DL.2 fixture server.

Naming and Deleting User Content Files and Folders

You can **Rename** any user content folder or file displayed in the right pane of the CMA window using the pull down **Media Folders** or **3D Objects** menu or with a right click selection. Use the standard Windows operating system naming conventions.

You can **Delete** any user content folder or file displayed in the right pane of the CMA window using the pull down **Media Folders** or **3D Objects** menu or with a right click selection.

Note: You cannot Delete a movie if the DL.2 server is playing it.

Assigning DMX Values to User Content

The DMX Value associated with each file and folder makes it easy to use the DMX control protocol to identify a unique media file or 3D object.

There are up to 240 Media file folders with each capable of containing up to 255 image or movie media files. This gives a theoretical total of 61,200 possible locations for Media image or movie files. There is one DMX parameter used to identify a 3D object so 255 DMX values are available between the Stock and User Content to identify 3D objects.

Assigning DMX Values Automatically

The CMA can automatically assign a unique DMX value to any file or folder on a fixture that does not already have a value. This automated assignment is based on alphabetically sorting the existing file/folder names, and assigning each item a unique consecutive integer.

To automatically assign DMX values to a single file or folder with user content:

1. Display the User content folder or file in the right pane of the CMA Window
2. Select **AutoSet DMX** from either the **Media Files** folder or **3D Objects** drop down menu or the right click popup list. The CMA will assign a valid DMX value to the file or the folder.

You can automatically assign DMX values to all folders at once or to all the files within a folder at once. You cannot set both files and folder values at the same time. To automatically assign DMX values to all the User content folders or all files within a User content folder:

1. Display the User content folders or the files for a single folder in the right pane of the Content Management window and deselect all files or folders.
2. Select **Autoset All DMX** from either the **Media Folders** or **3D Objects** drop down menu or the right click popup list. The CMA will assign a valid DMX value to all selected files or folders.

Using the same steps, you can also **Reset DMX** for a single file or folder or **Reset All DMX** for all display files or folders displayed in the right pane to zero.

Editing User Content DMX Values

You can manually assign any valid DMX value to your files or folders by selecting the file or folder in the right pane and then, using the pull down menu or the right click popup, selecting **Edit DMX**. A dialog box will allow you to input the DMX value. If it is a valid value from 0-255, the CMA will change the DMX value displayed for the file or folder.

Valid DMX Values

Certain DMX values are **Reserved** for special purposes and are not user assignable. You can change the assigned DMX value for a User Content item to another valid DMX value. A valid DMX value is:

- From 0-255
- Is not one of the reserved values for that type of content
- Is unique from other content of it's type except for zero

The following table shows valid and reserved values for User Content.

Content Type	DMX Values	Description	Reserved?
Media Folders (media file collections)	0	No Selection	No
	1-40	Default Stock media	Yes
	41-239	User collections	No
	240-254	Reserved	Yes
	255	Internal Camera video feed	Yes
Media Files	0	No Selection	No
	1-255	Media files	No
Objects	0	No selection	No
	1-149	Stock 3D Objects	Yes
	150-255	User 3D Objects	No

Moving User Content Files and Folders

User content can be easily moved between fixtures and your local drive as well as between fixtures. Which method you use depends on:

- How much content you want to move
- What existing server content you want to preserve
- Whether the client machine is currently connected to the ethernet fixture link
- If you want to maintain currently assigned content identification DMX values
- Which CMA version you are using (Windows or Mac OS)

There are several methods for moving User content files and media folders between DL.2 fixtures to your local drive:

- Drag and Drop
- Copy and Paste commands
- Cloning transfers the User Content files and their DMX value assignments from one DL.2 server to other server(s) on the fixture network.
- Creating a Content Archive
- Deploying a Content Archive

Use the following table to determine the best method for your situation.

Fixture Network File-Transfer Method	Transfer Type			Notes
	From Server to Client Machine	From Client Machine to Server(s)	Between Networked DL.2 Server(s)	
Drag and Drop	Yes	Yes, if format is valid for destination folder	No	Does NOT preserve DMX Values
Copy and Paste commands	Yes	Yes	No	
Clone	No	No	Yes	Preserves DMX values and Replaces any previous User Content on destination drive
Deploying a Content Archive	No	Yes	No	
Creating a Content Archive	Yes	No	No	Saves assigned DMX values when creating archive from content on a fixture

Downloading Content from a DL.2 Fixture to Your Local Drive

The CMA supports downloading User content files or folders from a DL.2 fixture to your local drive. To download a file or folder of User Content:

1. Display the Folder or File that you wish to move in the right pane of the CMA window
2. If the destination for the file on your local drive is visible, you can simply drag and drop the folder or file to that location or an external drive connected to your computer.

   OR

3. Select **Copy** from the **Media Files** or **3D Objects** drop down menu or the right click popup list.
4. Browse to the destination on your hard drive; then select **Paste** from the **Media Files** or **3D Objects** drop down menu or the right click popup list.

Mac OS X: Downloading files

You can drag single or multiple files and folders from a fixture to the Finder.

You cannot use the copy/paste (Apple-C, Apple-V) to move a single file or folder from a fixture to the Finder.

Mac OS X: File transfer

SMB limitation is 4GB file size per transfer. What this means is more than 4GB of data may be transferred, but no file can be greater than 4GB in size.

Uploading Content from Your Local Drive to a DL.2 Fixture

You can upload User Content Media files, Media folders and 3D object files from your hard drive to a DL.2 Server, provided they are:

- A valid file format (.jpg, .gif, .png, .bmp, .avi, .mpg, .m2v for Media Files; .x for 3D Object files)
- You are uploading them to the appropriate User content folder on the DL.2 fixture server

To upload content:

1. Display the file or folder destination in the right pane of the CMA window
2. Browse to the file or folder you want to upload on your hard drive and click on it to select.
3. Drag and drop it into the appropriate User content folder

   OR

4. Select **Copy** from the **Edit** drop down menu or the right click popup list.
5. Select **Paste** from the **Media Files** or **3D Objects** drop down menu or the right click popup list.

As files are uploaded to fixtures, the User interface displays progress information and notifies the user of any naming conflicts when files are renamed.

A newly uploaded file or folder will have a default DMX value of zero. If a naming conflict occurs, you will be prompted before overwriting the file.

Mac OS X: File transfer

SMB limitation is 4GB file size per transfer. What this means is more than 4GB of data may be transferred, but no file can be greater than 4GB in size.

Moving Files Between Fixtures

The CMA can transfer both individual files or entire folders between fixtures. The DMX values assigned to the files are transferred along with the files themselves. You can also simultaneously transfer files from one fixture to a group of fixtures.

Archiving User Content

An Archive/Image is a compressed file used to store media files, folders and object files along with valid identification DMX values. This Content Archive is used to backup User Content that can be restored to any DL.2 server.

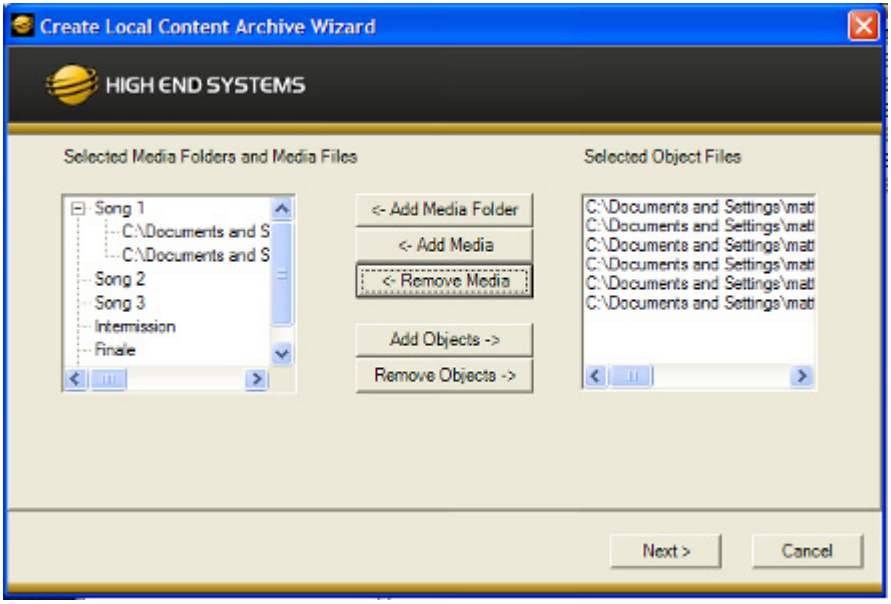
Using Local Archives to Prepare Content Offline

You can create a Local Archive of files stored on your harddrive to be deployed to a server at another time. This lets you work on organizing files for a specific show offline and then upload it to a server at a later date.

Creating a Local Archive

For CMA Running Windows XP

1. Under the FILE menu, select **Create Local Archive** to launch the archiving wizard.



2. Click on **Add Media Folder.** This will add a media folder to the left-hand column named “MyMedia0”. Each successive media folder will be named “MyMedia1, MyMedia2, and so forth. You can rename these folders by single clicking on the name of the folder
3. After creating a folder and renaming it (if you wish), highlight the folder to add media files.
4. Click **Add Media**. This will bring up a file browser window that will allow you to navigate to the spot on your hard drive containing the media you want to add. You can add single files or multiple files. To add multiple files, hold down shift and select multiple media files with your mouse.

5. Click **Add Objects** if you wish to add custom 3-D objects to the archive. This will again bring up a file browser window to navigate to you 3-D objects. Any 3-D objects added will appear in the right hand column of the wizard. 3-D objects do not get added to folders.
6. Click **Next** at the bottom of the wizard. This will take you to another screen where you choose where to save and what to name your archive.
7. Click **Browse** to navigate to where you want to save and name your archive.
8. Click **Next.** Your archive will then be created.

NOTES: The Remove Media and Remove Object buttons can be used to remove media files and objects from the wizard when creating the archive.

Currently, the archive will not be created unless each media folder created has at least one media file in it.

All media folders, files and objects will be assigned DMX addresses in alphabetical fashion.

For CMA Running Mac OS 10.4

To create a Local Archive, you must first create the folder structure recognized by the CMA. The Creative Local Archive compresses these files into a .dlc format that can be recognized for uploading. Use the following folder structure in preparing files for a local Archive:

- A top level folder, which contains a Media and Objects folder.
- The Media folder must contain subfolders, and valid files may go into those subfolders.
- Only objects with a .x extension are allowed in the Objects folder (no subfolders).

Creating Content Backup Archive

Backups are created using the Content Archive feature. An Content Archive file is a compressed file containing all the User Content from a single fixture along with the assigned DMX values for folders and files.

To create a Content Archive

1. In the Management Client Window select **All Server** in the left pane.
2. Select the Server with the content you want to backup in the right pane.
3. Select **Create Content Archive** from the **Media Files** or **3D Objects** drop down menu or the right click popup list.

Deploying a Content Archive

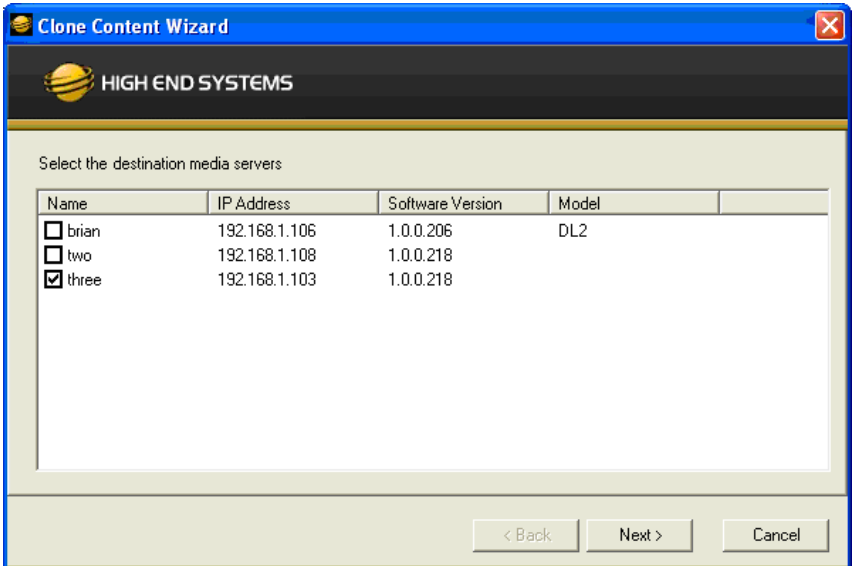
Deploying the Content Archive you created restores the user content to a fixture. To replicate this content to other fixtures on the link, use the Clone Content feature (see *Cloning User Content* on page 148).

Cloning User Content

Cloning is a file transfer operation where all the User Content of a single fixture is replicated across one or more other fixtures. Cloning preserves all user content naming and DMX values. This allows you, for example, to send the custom content for a specific show to all the fixtures used in that show with one operation.

To clone user content:

1. In the Management Client Window select **All Server** in the left pane.
2. Select the Server with the content you want to clone in the right pane.
3. Select **Clone Content** from the **Media Files** or **3D Objects** drop down menu or the right click popup list. A Clone Content Wizard lets you select one or more servers on the fixture network as the destination for the cloned content.

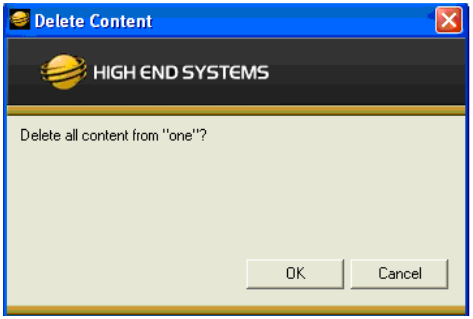


The cloning process erases all destination server(s) user content and replaces it with the selected server's user content. Stock content is unaffected.

Deleting Content

To delete ***all*** User Content from a server:

1. In the Management Client Window select **All Server** in the left pane.
2. Select the Server with the content you want to delete in the right pane.
3. From the drop down menu or the right-click popup list, select **Delete Content.** A dialog box OKs/cancels the action.



DMX Summary

The DMX Summary lets you view all the content for a single server in a table format with the following details:

- Whether the content is a **User** Media file/folder, a **Stock** Media file/folder, or a 3D **Object**
- The associated **Folder Name** for media files
- The **Folder DMX** value for media files
- The **File Name** for media or object files
- The **File DMX** value for media or object files

To view the DMX summary table:

1. Select **All Servers** from the left pane of the Management Client Window.
2. Select a Server in the right pane
3. Select DMX Summary from the drop down menu or the right-click popup list.
4. Press the **Create Table** button on the screen to build the summary table.

Upgrading Software

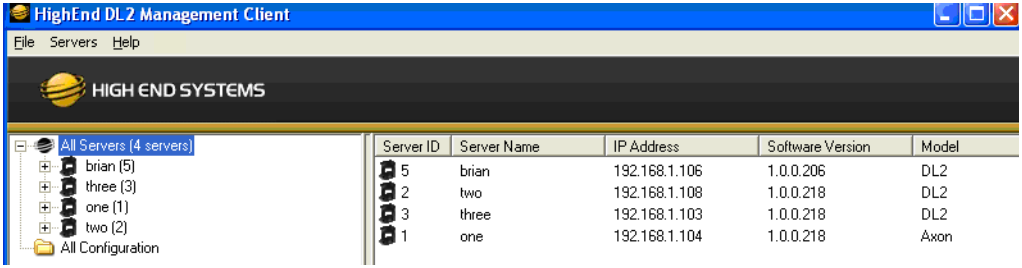
Upgrade Management allows the user to upgrade the DL.2 fixture applications, Mac OS 10.4 or the XP Embedded operating system, and fixture firmware on the system.

Verifying Software Versions

Running the latest version of both the CMA Client software and the DL.2 Server software will ensure that you will get the best performance from the fixtures on your network.

To verify the CMA version, select **About** from the **Help** drop down menu. The DL.2 software version is displayed for each server on the network in the All Servers view.

Note: ***Although running different versions of software on servers is not prohibited, it is highly recommended that all servers on the network be running the same software version.***



Upgrading the CMA Software

Close the CMA before upgrading the CMA software. To Upgrade software:

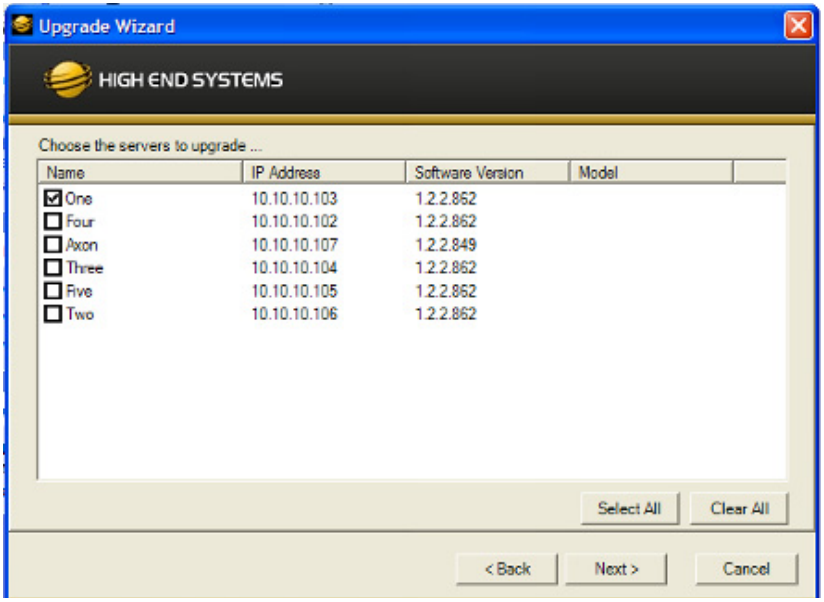
1. Download the latest version of the application from the Support section of the High End Systems website (www.highend.com). A download wizard simplifies installation on your personal computer.
2. A dialog box will give you the option to Run or Save the application. Pressing **Run** automatically un-installs any existing CMA version on your hard drive and installs the new version.

Upgrading DL.2 Fixture Software

DL.2 fixture software can only be uploaded to fixtures from the CMA. You must first save the latest version of the DL.2 fixture software from the High End Systems website (www.highend.com) to your hard drive and then use the CMA to upload it to the fixtures on your link. To Upgrade DL.2 Fixture Software:

1. Using your internet browser, select the latest version from the support section of the High End Systems website. A dialog box will give you the option to Save.
2. Select the location and press Save again to put a copy of the Fixture software on your local drive.
3. Click on **All Servers** in the left pane of CMA Management window.
4. Right click anywhere in the CMA Window or use the Server's pull down menu to select **Upgrade Software**. The Upgrade Wizard will prompt you to browse to the location where you saved a copy of latest version.
5. After locating the upgrade file, press Next. The Upgrade Wizard displays a list of all servers connected to the fixture network.

6. Click in the box to the left of the server name to select a server(s) for upgrading.



7. Click **Next** to continue upgrade. The DL.2 will reboot after the upgrading the software.

Mac OS X: Upgrading Software

To upgrade multiple servers, select multiple fixtures from the* All Servers *list.

Viewing and Editing Fixture Configuration

The CMA lets you remotely view and modify fixture settings.

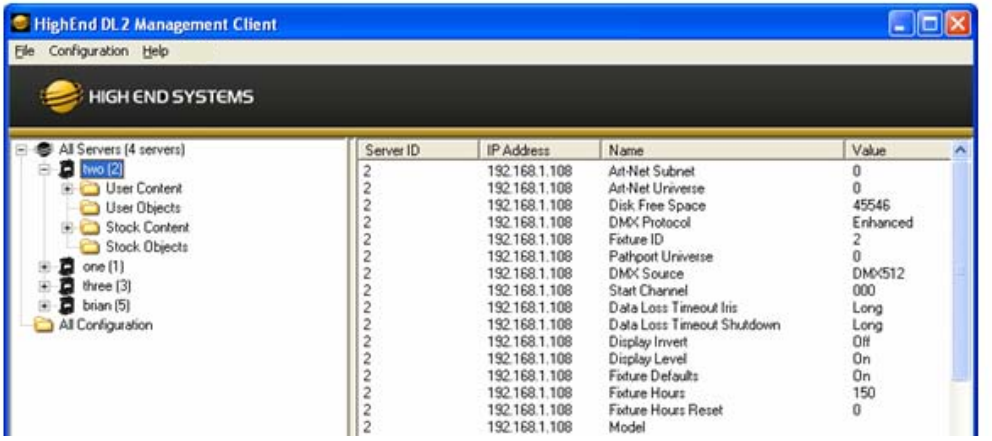
Some settings like Lamp Hours, CPU Temperature, Software Versions, etc. are view only. Other settings such as Fixture ID, various Projector settings, DMX Start Channel, etc. can be modified (configured).

All of these settings are available for each fixture through the fixture menu system, see *Chapter 3: The DL.2 Menu System* on page 19. The CMA has some additional configuration features that let you:

- Assign a name to servers connected over the network for easier identification of servers on your network.
- Compare all the Configuration Items of a certain type for a group of fixtures. For example, viewing the CPU Temperature for all the fixtures on a network.

Viewing Fixture Configuration Values

To view configuration information for a individual server, click on **All Servers** in the left pane of the CMA window and select the + to view all the servers on the fixture network. Select a server in the left pane to view its configuration information in the right pane.



Mac OS X: Viewing Server Configuration

To access Server Configuration information for an individual server, select the Configuration option under the individual server.

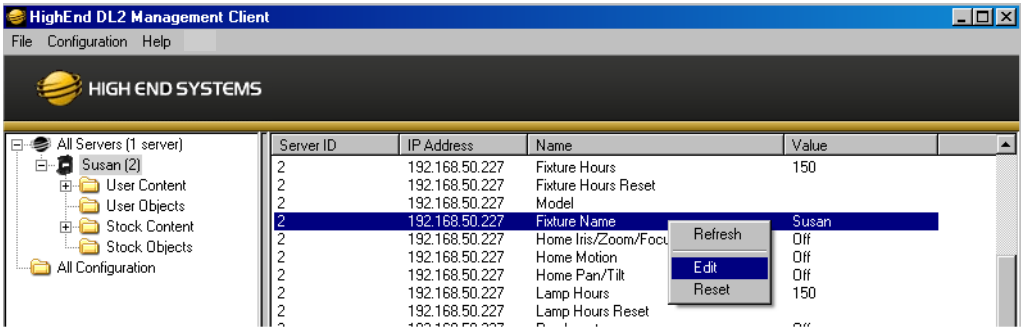
To view configuration information for all Servers on the network, select All Configurations in the left pane. The right pane now displays configuration values for all the DL.2 servers on the fixture link in a sortable table. Click in the column heading to sort by that column's values. A + symbol appears in the "sort by" column heading.

Editing Configuration Values

The Configuration table viewed in the right pane of the CMA window contains the following information for one or all servers:

- The server ID from 1-255
- The IP Address
- The configuration item name
- The current option setting

A right-click on a item will popup a list including Refresh, Edit or Reset. You can also double-click an item to bring up the edit dialog box. The Edit dialog box lets you choose between available options for that item.



The following table shows the configuration values available for viewing and/or editing.

Note: ***Read Only options are for information display only and cannot be edited. If you select or type in an option that is invalid, the OK button will be grayed out and not selectable.***

Configuration Item	Configuration Value Options
Art-Net Subnet	**0-16**
Art-Net Universe	**0-16**
Box Current Temperature	**Read only**
Box Maximum Temperature	**Read only**
Box Minimum Temperature	**Read only**
Box Temperature Reset	Pressing **Reset** restores value to Current Temperature
CPU Current Temperature	**Read only**
CPU Maximum Temperature	**Read only**
CPU Minimum Temperature	**Read only**
CPU Temperature Reset	Pressing **Reset** restores value to Current Temperature
Data Loss Timeout Iris	Closes iris when system stops receiving DMX data: **Long** = 5 minute delay **Short** = 5 second delay
Disk Free Space	**Read only**
Display Invert	**On** manually inverts display, **Off** reverts to default display orientation, **Auto** automatically inverts display when fixture is turned more than 90 degrees vertically.
Display Level	**Off** turns off display. Touching any button turns it back on. **Dim** lowers the brightness level **Bright** = full brightness level **Preview =** displays currently selected content

Configuration Item	Configuration Value Options
DMX Protocol	**Standard** = 170 channel footprint **Dual** = 132 channels **Single** = 94 channels
DMX Source	**DMX512** or **Art-Net**
Enable Focus Override	**On** selects manual focus **Off** resets to DMX control
Enable Zoom Override	**On** selects manual zoom **Off** resets to DMX control
Fixture Defaults	**On** restores fixture defaults **Off** displays whenever defaults has been changed
Fixture Hours	**Read only**
Fixture Hours Reset	Pressing **Reset** restores fixture hours to 0
Fixture ID	**1-255**
Fixture Name	Allows fixture name of up to 26 characters
Graphics Processor Current Temperature	**Read only**
Graphics Processor Maximum Temperature	**Read only**
Graphics Processor Minimum Temperature	**Read only**
Graphics Processor Temperature Reset	Pressing **Reset** restores value to Current Temperature
Head Current Temperature	**Read only**
Head Maximum Temperature	**Read only**
Head Minimum Temperature	**Read only**
Head Temperature Reset	Pressing **Reset** restores value to Current Temperature
Home Iris/Zoom/Focus	Press **Home** to start automatic mechanical reset for Iris, Zoom and Focus function
Home Motion	Press **Home** to start automatic mechanical reset for all motion functions.
Home Pan/Tilt	Press **Home** to start automatic mechanical reset for Pan and Tilt function
Lamp Hours	Read Only
Lamp Hours Reset	Pressing **Reset** restores Lamp hours to 0
Mainboard Current Temperature	**Read only**
Mainboard Maximum Temperature	**Read only**
Mainboard Minimum Temperature	**Read only**
Mainboard Temperature Reset	Pressing **Reset** restores value to Current Temperature
Model	**Read only**
Pan Invert	**On** Inverts pan positioning **Off** reverts to default position

Configuration Item	Configuration Value Options
Pan/Tilt Swap	**On** swaps pan and tilt positioning **Off** reverts to default positioning
Projector Control Menu	**On** access the Projector menu **Off** reverts to DL.2 menu
Projector Defaults	Selecting this option automatically restores projector defaults
Projector Focus Value	**0-255**
Projector Input	**External** accepts input from an external video source **Internal** accepts input from the graphics engine
Projector Input Selection by DMX	**Yes** allows projector input to be switched via DMX **No** disables projector input switching via DMX
Projector Startup Mode	**Always On**turns lamp on when the fixture is plugged in **Manual** turns lamp on only if the Lamp is set to **On** **DMX** turns lamp on if DMX is present
Projector Lamp On	**On** **Off**
Projector Zoom Value	**0-255**
Upgrade Content	Press **Upgrade** to upgrade stock content
Restore Settings	Press **Restore** to revert to factory fixture settings
Self Test Focus	**On** tests focus mechanical functionality **Off** stops self test
Self Test Iris	**On** tests Iris mechanical functionality **Off** stops self test
Self Test Pan/Tilt	**On** tests Pan and Tilt mechanical functionality **Off** stops self test
Self Test Video Pattern	Select from a list of Patterns to test graphics engine functionality
Self Test Zoom	**On** tests Zoom mechanical functionality **Off** stops self test
Reboot	Press **Reboot** to restart the internal graphics engine
Software Version	**Read only**
Start Channel	**0-255**
External SVideo Format	**NTSC_M** **NTSC_MJ** **PAL_B** **PAL_D** **PAL_G** **PAL_H** **PAL_I** **PAL_M** **PAL_N** **SECAM_B** **SECAM_D** **SECAM_G** **SECAM_H** **SECAM_K** **SECAM_K1** **SECAM_L** **SECAM_L1**
Tilt Invert	**On** Inverts Tilt positioning **Off** reverts to default position
Unique Number	**Read only**

Chapter 15:

Maintenance and Troubleshooting

This chapter includes information on replacing parts, cleaning the fixture, and some basic troubleshooting procedures.

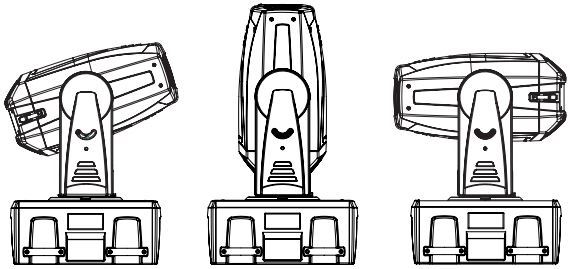
The following toolset should be all you need for the maintenance procedures in this chapter:

- M3 allen wrench
- M4 allen wrench
- #2 Phillips screwdriver
- Gloves
- Protective eyewear
- Mild glass cleaner (containing no ammonia) and a soft, lint-free cotton cloth

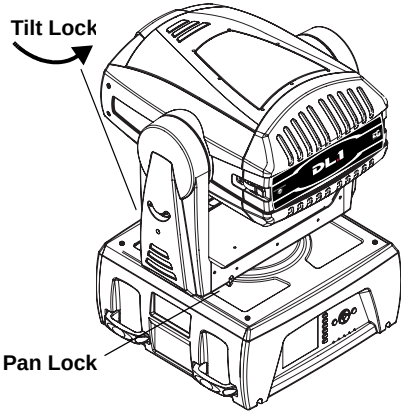
WARNING:
This fixture must be serviced by qualified personnel. The information listed in this chapter is intended to assist qualified personnel *only*.

Pan and Tilt Locking

The DL.2 fixture is equipped with mechanical pan and tilt locking latches to stabilize the fixture for shipping or servicing. There is a single pan lock position and three tilt lock positions.



Tilt Lock Position Options



Maintaining the Filtering System

Like all high quality video projection units, the DL.2 fixture must be kept protected from excessive amounts of glycol fog, mineral oil, and smoke. DL.2 fixtures incorporate multiple air filters to reduce these risks to a minimum; however, the user must follow these guidelines to ensure continued operation of the fixture:

- Air filters (both fixture and projector) should be checked and cleaned on a regular basis. When used in a closed or fixed environment where fog or haze is used, we recommend at least a weekly check.
- Do not situate DL.2 in areas of high fog density such as directly in front of a fog machine or mineral oil hazer.
- Minimize the exposure of DL.2 to both glycol fog and mineral oil.

Filter Warnings

The DL.2 menu system displays a series of filter status and warnings to alert you when a filter needs to be cleaned or replaced. These appear in a large format that can be viewed from a distance. The Info_Status menu screen will include a detailed message concerning the large format Error/Warning filter message. The following messages will give you information regarding the status of the DL.2 filter system:

- **Filter Missing Error:** A filter not present or is not installed properly. Check and insert missing filter.
- **Filter Service Warning:** The filter system is not operating optimally and needs to be serviced soon.
- **Filter Service Error**: The filter system needs immediate servicing. Replace Filter.

For these and other Error/Warning messages, see *Status Message Menu Display* on page 165.

Cleaning and Replacing Filters

The DL.2 system utilizes multiple filters to protect the internal media server and projector.

- A filter is located on the side of the fixture base housing attached with velcro for easy removal and cleaning. Check this filter often for dust or debris that can be caused when using the DL.2 in environments with confetti or pyrotechnics. ***This filter is washable, but must be completely dry before re-installing.***
- The Fixture head contains both a hepa filter and a prefilter
- The internal projector has two filters

Check the following warnings and cautions before servicing the filters:

WARNINGS!

Disconnect power before servicing.

Replace fuses with the specified type and rating only.

Equipment surfaces may reach temperatures up to 130° C (266° F). Allow the fixture to cool before handling.

CAUTION!

Do not operate a projector with Air Filter removed. Dust may accumulate on LCD Panel and Projection Mirror degrading projection quality.

Do not put small parts into Air Intake Vents. It may result in malfunction of a projector.

Cleaning the Base Housing Filter

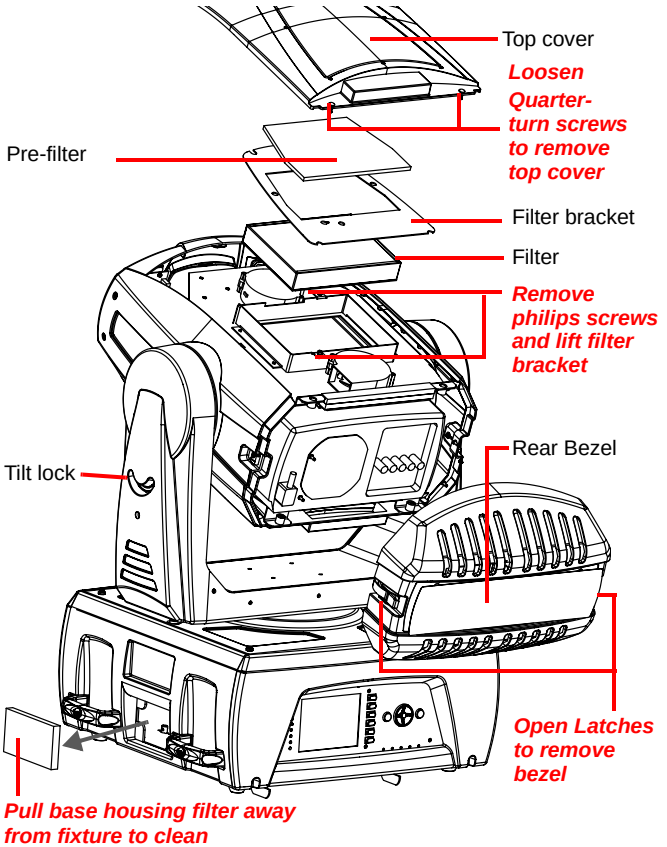
This filter is located between the handles on the fan side of the box. You can pull it off the fixture and clean it with soap and water. Allow it to dry thoroughly before replacing.

Replacing the Fixture Filter

A hepa filter and a prefilter are located inside the fixture head and should be replaced whenever they become discolored from particulates or when the Menu displays **FILTER Service ERROR** or **FILTER Service WARN**

Access the fixture filters

1. Lock the fixture head in the 70° tilt position.
2. Unlatch and remove the rear bezel assembly.
3. Loosen the two quarter-turn screws on the top cover and remove the top cover.
4. Slide the top cover back to free it from the front bezel.



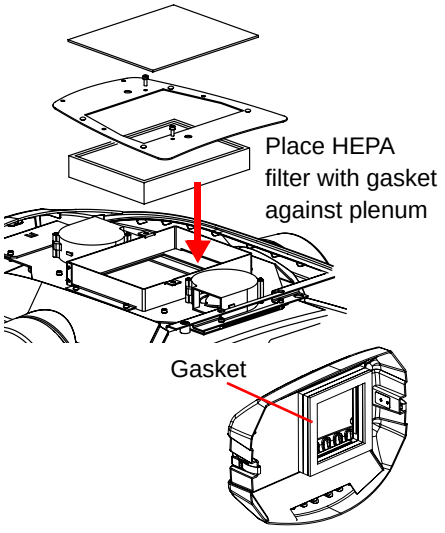
Inspect the filters:

5. Lift the prefilter away from the filter bracket
6. Remove the two philips pan screws securing the filter bracket and lift the filter unit off the fixture.

7. Remove the bracket and lift the HEPA filter out of the filter housing. Inspect both the prefilter and the HEPA filter.
8. A dirty prefitler can cause an early Service Filter warning. If the prefilter looks dirty, clean it with water. Thoroughly dry the prefilter before proceeding.
9. If the HEPA filter is discolored with particulates, replace it with the part listed in *Related Products and Optional Accessories* on page 3.

Reassemble the Fixture

10. Reinstall the HEPA Filter with the rubber gasket down.
11. Reattach the filter bracket with the two philips pan screws.
12. Replace the prefilter over the bracket on velcro tabs.
13. Replace the top cover, fastening it with the two quarter-turn screws.
14. Carefully replace the rear bezel, making sure to position (but *do not force*) the gasket against the lamp cover located on the back of the projector. and Relatch the rear bezel assembly.

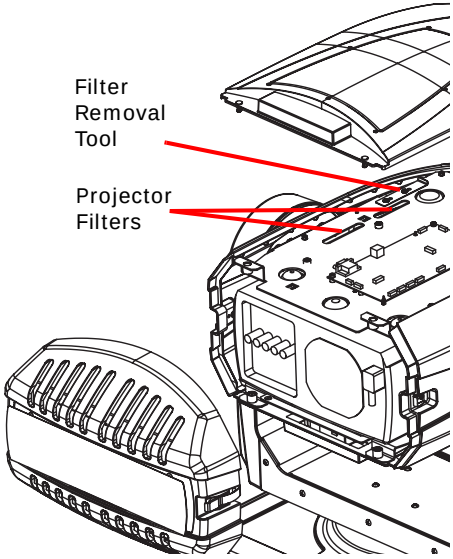


Cleaning the Internal Projector Filter

Internal projector air filters prevent dust from accumulating on surface of Projection Lens and Projection Mirror. If the projector Air Filter becomes clogged with dust particles, it will reduce the cooling fans' effectiveness and may result in an internal heat build up that can shorten projector life.

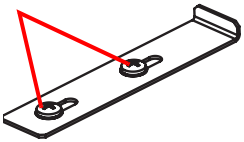
Clean the projector air filter using the following steps:

1. Disconnect the fixture from power.
2. Rotate and lock the fixture head in the or 90° tilt position.
3. Unlatch and remove the rear bezel.
4. Loosen two quarter-turn screws to remove the bottom cover and locate the *filter removal tool* mounted on the chassis.



5. Loosen the 2 phillips head screws to remove the tool and use it to grasp and lift the two air filters from the internal projector.
6. Clean air filter with compresses air, a brush or wash out dust and particles with mild soap and water.
7. If the filter damaged, replace it only with the part listed in *Related Products and Optional Accessories* on page 3.

Loosen screws to remove tool



8. Replace ***completely dry*** filters in slot. The filters are keyed for positioning. Make sure that both filters are fully inserted.

Replacing the Lamp

WARNING!

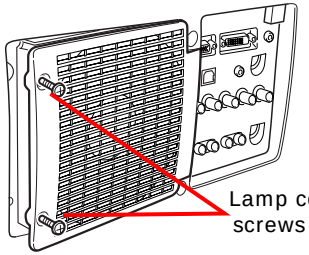
Equipment surfaces may reach temperatures up to 130° C (266° F). Do not attempt to hot-restrike the lamp.

Allow the projector to cool for at least 45 minutes before you open the lamp cover. The inside of the projector can become very hot.

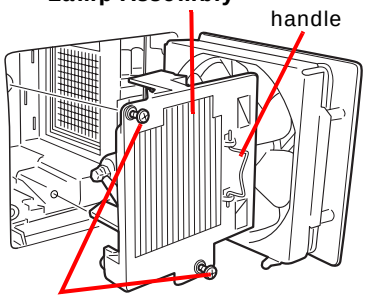
For continued safety, replace with a lamp assembly of the same type.

Do not drop the lamp module or touch the glass bulb! The glass can shatter and cause injury.

1. Shut down the fixture and disconnect from power.
2. Allow the projector to cool for at least 45 minutes.
3. Unlatch and remove the back bezel.
4. Loosen the two phillips head screws and open the lamp cover.
5. Loosen the two phillips head screws, grasping the handle and pull out the lamp assembly.
6. Replace the lamp assembly, see *Related Products and Optional Accessories* on page 3.
7. Seat the assembly and tighten the two lamp assembly screws.
8. Close the lamp cover and tighten the two lap cover screws.
9. Reconnect to power.



Lamp Assembly



Replacing the Fuse

WARNINGS!

Disconnect power before servicing.

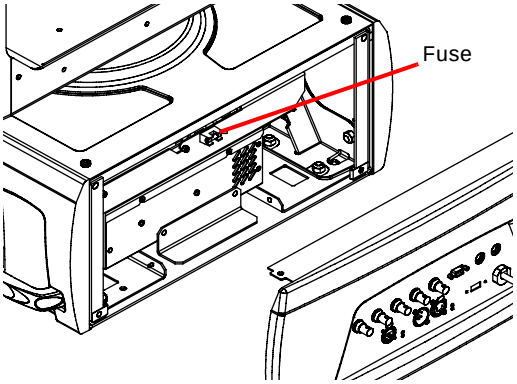
Replace fuses with the specified type and rating only.

Equipment surfaces may reach temperatures up to 130° C (266° F). Allow the fixture to cool before handling.

The DL.2 has one user-serviceable fuse which controls mains voltage to the fixture.

To replace a fuse:

1. Disconnect power to the fixture. If the fixture has been operating, allow the fixture to cool before handling.
2. Loosen the 2 Phillips head screws on the top cover of the connector side of the box.
3. Tilt the connector panel away from the box
4. Remove the fuse from the fuse holder.
5. Replace the fuse with a 5A, slow-blow fuse *only*.
6. Replace the side and top panels.



Cleaning or Replacing the Front Window

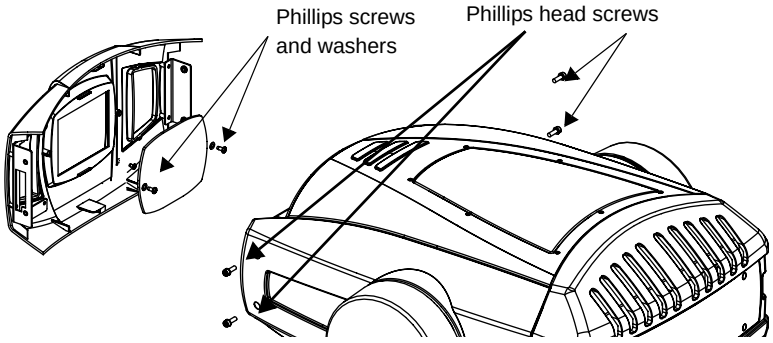
WARNINGS!

Disconnect power before servicing.

Equipment surfaces may reach temperatures up to 130° C (266° F). Allow the fixture to cool before handling.

To access the front window:

1. Remove the four phillips head screws (two on each side of the front bezel)
2. Slide the bezel from the front of the fixture.



3. Disconnect power to infrared illuminator.
4. Inside the bezel, locate the two Phillips head screws and washers securing the front window in place.
5. Remove the screws, making sure not to misplace the washers.
6. Clean the front window using a mild glass cleaner (containing no ammonia) and a soft, lint-free cotton cloth.
7. If the window needs replacement, use the part specified in *Related Products and Optional Accessories* on page 3.
8. Carefully replace the Phillips screws and washers, making sure not to break the glass.

CAUTION!

Use plastic washers only when replacing the front glass. Using metal washers can damage the glass.

9. Reconnect power to the infrared illuminator
10. Replace the front bezel.

Replacing Motor Driver Boards

WARNINGS!

Disconnect power before servicing.

Replace fuses with the specified type and rating only.

Equipment surfaces may reach temperatures up to 130° C (266° F). Allow the fixture to cool before handling.

The DL.2 fixture is designed with two motor driver boards:

1. The board that controls the motors for the tilt, focus, zoom, and iris functions as well as fans is located in the fixture head.
2. The board that drives pan motor and fans is located in the base housing.

All cabling is marked with labels corresponding to locations on board for easy replacement. When changing a board, align the screw holes and standoffs to ensure correct orientation in the fixture.

CAUTION!

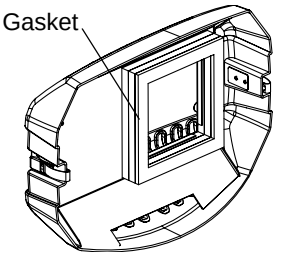
The fixture will not function correctly if contact screws are missing from driver boards.

Fixture Head Driver Board

To replace the fixture head driver board:

1. Disconnect power to the fixture and allow it to cool.
2. Unlatch the two rear latches and remove the rear bezel.
3. Use a 3 mm allen wrench to remove the addressing screws and star washers.
4. Position new board against module aligning the center top standoff. Place contact screw(s) in the appropriate position.

   Note: When installing a replacement driver board on a module, always place a star washer between an address screw and the pad on the logic board to ensure good electrical contact.



5. Carefully replace the rear bezel, making sure to place (but *do not force*) the gasket over the lamp cover located on the back of the projector.
6. Ensure that the fixture is on a solid surface. Select **Calibrate Motors** through the Test_Home menu screen and leave the fixture undisturbed for 10 minutes while calibration occurs.

Replacing Fixture Base Driver Board

To replace motor driver board located in the fixture base housing:

1. Disconnect power to the fixture. If the fixture has been operating, allow the fixture to cool before handling.
2. Loosen the two phillips head screws on menu display panel side of the Box cover
3. Loosen screws on menu display panel and gently open away from the fixture leaving the harness cabling attached.
4. The driver board for pan functions and fans is located directly behind the display**.**
5. After detaching all cabling, pull board out and replace.

CAUTION!
The fixture will not function correctly if contact screws are missing from driver boards.

6. Reattach cables.
7. Replace the side panel and top cover. Make sure you align the assembly properly when inserting; damage to the fixture can result from improper alignment.
8. Ensure that the fixture is on a solid surface. Select **Calibrate Motors** through the Test_Home menu screen and leave the fixture undisturbed for 10 minutes while calibration occurs.

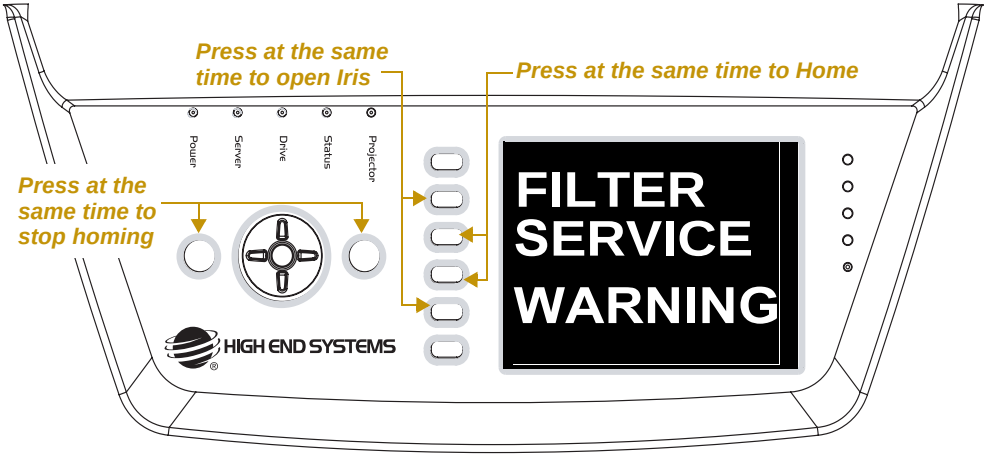
Troubleshooting

This section discusses troubleshooting LED states and general troubleshooting suggestions.

Button Shortcut Commands

DL.2 fixtures have button commands available for controlling and overriding functionality when you are troubleshooting your fixture.

- Holding the [Menu] & [Enter] buttons for more than two seconds disables motion system. Motors are still energized so unit can be pointed for trouble shooting. To Exit this mode, press the [Menu] & [Enter] buttons again for two seconds, or send a Global Reset command.
- Holding down the middle two menu Tab Select buttons for more than two seconds initiates a Global Reset of the motion hardware and homes the unit.
- Holding down the second from the top and second from the bottom Tab Select buttons for more than two seconds opens the iris when the fixture software is not running to allow navigation for content upgrades and motion uploads. To Exit this mode, press the same button combination again for more than two seconds.



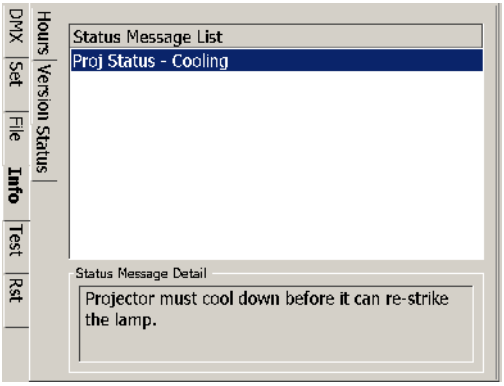
Large Format Error/Warning Message Display

Status Message Menu Display

The DL.2 fixture menu displays error/warning information in two ways. The first is the large block format that can be viewed from a distance when the menu is idle. When there is more than one message, the large format display cycles through the messages. Each message displays for 3 seconds before cycling to the next message and continues looping through these messages until they have been cleared internally or you interact with the menu.

Button Action

When in the large format display, pressing any button reverts to the normal menu display. showing the Detailed Message Display pane in the Info_Status tab of the menu. At that point, you can view the detailed information for the error/warning messages or navigate elsewhere.



Inactivity Timer

After 30 seconds of inactivity from the display navigation/editing buttons has passed, the display returns to the large format error display should there be any new messages to be displayed or if there is a persistent error. A persistent error is a case where the error condition continues to occur.

The second way to view Status messages is by navigating to the Info_Status screen. This screen displays current error or status messages. If there are multiple error/warning messages displayed, use the up/down arrows to scroll through the list in the top pane. When an item is highlighted in the top pane, the bottom pane details information associated with that error.

Supported Error/Warning Messages

Issue	Large Format Message	Message Detail	Notes
Projector Temperature Status	Info_Status tab only This message does not appear in large format	PROJ STATUS-COOLING The projector must cool down before it can re-strike the lamp	This message will end when the fixture has reached the recommended operational temperature
Motion Shut Down Status		Motion Shut Down The Motion Systems is in shut down mode. To return to normal operation, power cycle or perform a HOME ALL	Home the fixture through the menu system “Test_Home_Motion All_Home” screen, the CMA, (see *page 152*) or from the DMX console (see *page 128*).
Camera Communication Error	CAMERA COMM ERROR	The system is unable to communicate with the Camera.	Check the Ribbon cable connections at the camera and the head card. (the Blue side should be facing out). Use the camera’s zoom buttons to check that the camera has power.

Issue	Large Format Message	Message Detail	Notes
Filter Missing Error	FILTER MISSING ERROR	Filter not present. Insert Filter!	See *Cleaning and Replacing Filters* on page 158
Service Filter Error	FILTER SERVICE ERROR	Filter needs Servicing. Replace Filter NOW.	
Filter Service Warning	FILTER SERVICE WARN	Filter needs Servicing. Replace Filter SOON.	See *Cleaning and Replacing Filters* on page 158
Projector Lamp Life Error	LAMP LIFE ERROR	The Lamp has exceeded it's rated life and must be replaced now.	See *Replacing the Lamp* on page 161.
Projector Lamp Life Warning	LAMP LIFE WARN	The Lamp is nearing the end of it's rated life. Replace soon	
Projector Communication Error	PROJ COMM ERROR	The system is unable to communicate to the Projector.	Check the Comm cable connections at serial port on the back of projector and at the fixture head card. Make sure lamp is struck
Projector Temperature Fail Error	PROJ TEMP ERROR	Projector temperature has exceeded operational range and has shutdown	Cool fixture and then restrike the lamp
Projector Temperature Warning	PROJ TEMP WARN	Projector is over recommended operating temperature	
USB port Communication Error	USB INIT ERROR	The PC failed to initialize USB communication with the box card.	Contact High End Systems Customer Support
USB port Security Error	USB SECURE ERROR	USB failed to pass the hardware security test.	

System State LEDs

Five labeled LEDs on the display panel indicate the following system activity:

Name	Color	State	Description
Projector	White	On	Projector lamp is on
		Off	Projector lamp is off
		Blinking	Projector lamp is either cooling down or in a indeterminate state
Status	Green	On	(45 sec On/1.4 sec.Off) Running normal motion-control code
		Blinking	Board communication activity; for example, during a software upload
		Blinking Slowly	320 processor card in the base housing is receiving code.
Drive	Amber	Blinking	Hard drive activity
Server	Blue	Steady	Internal computer is receiving power
Power	Red	Steady	Fixture's Motion Control system is receiving power

Board LED States

LEDs located on DL.2 fixture boards indicate how the unit is functioning. The following Table lists LED States, and problems they may indicate.

Location	LED #	State	Problem?	Description
Fixture Head Card	LD1	Steady Orange	No	S3 (iris) sensor open
		Red, Green or OFF	Yes	Link communication error
	LD2	Slow Flashing Green	No	Running system code, normal operation
		Fast Flashing Green	Maybe	Running boot code, expecting or updating firmware
		Red, Green or OFF	Yes	No firmware or power
Base Housing Card	LD1	Flashing Green	No	Normal operation
		Flashing Red	Maybe	Updating firmware
	LD2	Off	Maybe	No DMX send or received
		Green	No	Receiving DMX
		Red	Maybe	Transmitting DMX
	LD3	Steady Orange	No	Normal Operation
		Red, Green or OFF	Yes	Link Communication error

General Troubleshooting Suggestions

The following table shows general troubleshooting suggestions:

Problem	Solution
Won't power on	• Check the fuse (*page 162*). • Verify fixture is plugged in to an appropriately-rated power source (power ratings are shown on *page 234*). • Check power cord wiring (page *page 234*).
During certain movements the fixture motion slows, missteps or loses position	• If you have loosened or tightened anything in the pan and tilt assemblies, the stepper motors may be out of alignment. Recalibrate pan and tilt motors by selecting Calibrate Motors button in the Test_Home menu screen.
Powers on but no image	• Is the mechanical iris closed? If so, check the setting for the Dimmer parameter, (see *Dimmer* on page 127.) • Did you recently change inputs? About 10 seconds are required for an input change to take effect. However, you might have selected an invalid input using projector controls. Try setting the projector back its defaults, (see *Reset Screen* on page 33. Or use DMX to exit the projector menu system (see *Projector Control* on page 129). • Make sure a video input is physically attached to the input you selected, and that the video feed is active.

Problem	Solution
Image is blurry, out of focus, or colors are unnatural	• Check the Fixture filters (see *page 159*). • Is the DL.2 mounted less than 1.4 meters to an object? If so, move the DL.2 farther away to enable it to focus properly. • Make sure the DL.2 is not operating near fog machines, hazers, or mineral oil hazers (see *Fog Machine Warning* on page 8). • Clean the front window (see *Cleaning or Replacing the Front Window* on page 162). • Check the lamp (see the projector manual shipped with the DL.2). • If you're using the projector's on-screen programming system, you can override zoom and focus using the menu system (see *Projector Control* on page 129.)
The LCD Menu display is off	• If the Blue LED is off, the Computer isn't receiving power. Press and hold the Top and Bottom Tab select buttons to restart computer, (see *Menu Panel Components* on page 19.) • If the screen is not backlit, press the LCD power button, (see *LCD Display Adjustment Buttons* on page 20.) • Check the Video In Video Out adapter on the video card (middle plug) connection. • Check that the connectors for the composite video cable at the LCD Screen and the Video card are seated securely.
Fixture behaves erratically or won't respond to DMX control	• Verify that the last unit on the DMX link is properly terminated, (see *Setting up a Standard DMX Link* on page 10. • To control the DL.2 with DMX, you must first enable DMX through the menu System (see *DMX_Control Screen* on page 25) or the CMA (see *Viewing and Editing Fixture Configuration* on page 151. • If you're using DMX to control the projector using its native menu system, make sure you send a safe command after each button command; otherwise, it's analogous to pressing a button on the projector menu system and not releasing it (see page *Projector Control* on page 129).

Frequently Asked Questions

How are DL.2 fixture IP addresses determined? In environments that utilize numerous DL.2s, is there risk of IP address conflicts?

DL.2 fixture IP addresses are determined one of two ways:

1. When using DHCP server (like router) IP is generated automatically
2. Without router IP is generated randomly by Windows called *Auto IP*

The generation of IP addresses is handled just as IP addresses are handled for Window networks

Is there a limit to the Ethernet cable run length from the fixtures to the CMA?

Ethernet Cat 5 limit is 100 meters. For longer distances use a router that takes fiber input to Cat 5 output as for typical Ethernet distribution.

What is the longest length High End Systems has tested for camera video distribution?

High End has tested up to 1000 feet of quality Cat 5 without noticing degradation of signal.

Does DL.2 support the file format "MPEG-4"?

MPEG-4 is not currently supported. Convert original graphics and video to MPEG 2.

Chapter 16:

Restoring the System

There are two types of system restore that you can perform on the DL.2 with your DL.2 System Restore CD: a "full" system restore or a "partial" system restore.

A Full System restore should only be done in the event of complete drive failure.

Caution: Contact High End Systems Support (http://www.highend.com) PRIOR to initiating a Full Restore!

A partial restore can be done to replace the O/S partition of the drive, but should only be done as part of a specified upgrade plan. In that case, the XPe image the fixture shipped with will need to be updated.

All system restore operations require the DL.2 System Restore CD that ships with each DL.2 fixture. If you have misplaced or damaged this CD, you may contact High End Systems (http://www.highend.com) for a replacement.

For a full system restore, you will also need:

- External USB DVD drive
- USB keyboard
- DL.2 Stock content obtained by contacting High End Systems Customer Support

For a partial system restore, you will also need:

- External USB CD drive
- USB keyboard

Optional components for system restore:

- USB mouse, which may require the addition of a USB hub.

Full System Restore

A full system restore will replace the entire contents of the DL.2 hard drive, including:

- Microsoft Windows Embedded Operating System
- DL.2 application
- DL.2 settings
- DL.2 Stock content

This type of restore should be used when you are trying to restore the fixture to factory state.

> ***Note:*** ***After a full system restore, all user content will be absent. You will need to re-transfer it to your fixture through the DL.2 CMA. Also, a full restore requires a USB DVD drive and takes between 45–90 minutes longer to perform than a partial restore, depending on the speed of your USB DVD drive.***

Partial System Restore (Preserving Content)

A partial system restore will replace the following components:

- Microsoft Windows Embedded Operating System
- DL.2 application

The partial restore does not replace the DL.2 settings, the DL.2 Stock content, or User content. As such, the partial system restore option exists as a convenience for users who are trying to restore their fixture's OS and application, but who need to preserve the content or settings on the DL.2 fixture. This type of restore also takes less time than a full restore.

> ***Note:*** ***Because this method does not completely erase the DL.2 hard drive, it also does not return the device to a factory state. To guarantee a complete return to a factory state, you must perform a full system restore.***

Performing the System Restore

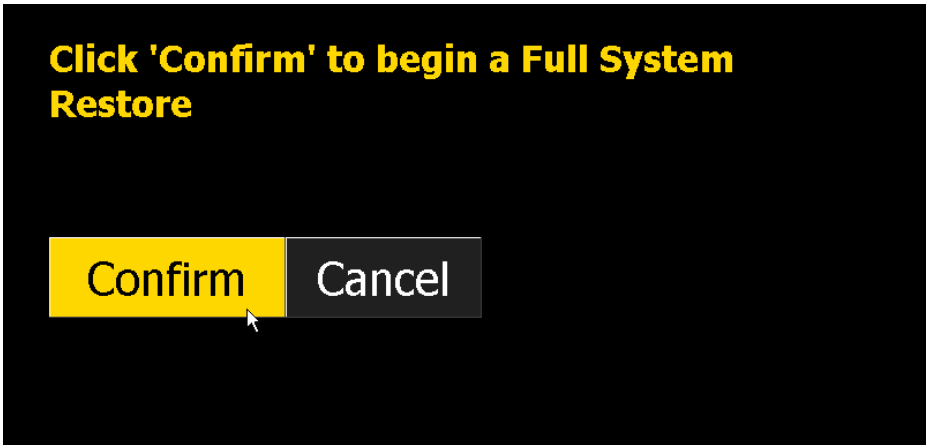
Follow steps 1–8 for a partial system restore. Continue through step 12 for a full system restore.

1. Position your fixture so that you can view the DL.2 menu on the LCD display.
2. Plug your USB CD or DVD drive, keyboard, and mouse (optional) into one of the external USB ports on the DL.2. If necessary, you may need to use a USB hub, although this should only be a requirement if you wish to use a mouse.
3. Power on or reboot the DL.2. When you see “Hit any key to boot from CD…”, press a key on your keyboard.
4. Allow the System Restore menu to load. Depending on the speed of your USB drive, it will take between 3-5 minutes load. During this time, a number of small windows will appear and disappear. Wait until you see a full-screen menu titled *DL.2 System Restore Menu.*

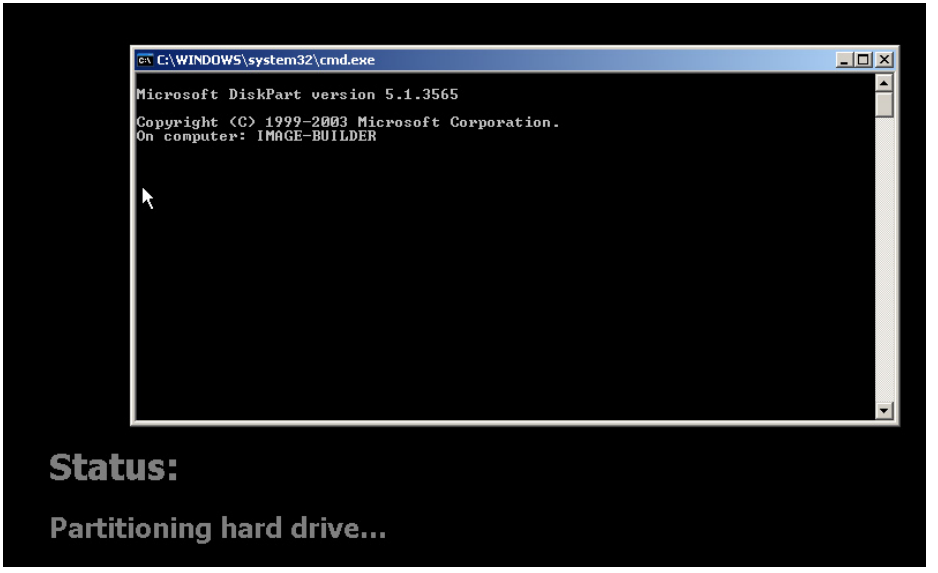
DL2 System Restore Menu
Please click the appropriate restore option, or use <Tab> on your keyboard to highlight the appropriate restore option and hit <Enter>
Full System Restore
Partial Restore, Preserving Content
Exit

5. Using the <Tab> key on your keyboard or using your mouse, select the type of restore you wish to perform.

6. The next page will ask you to confirm your selection. Press 'Confirm' and the restore will begin.



7. Allow the restore to run. This will take between 10-30 minutes depending on the speed of your USB drive. Status will be displayed throughout the restore.

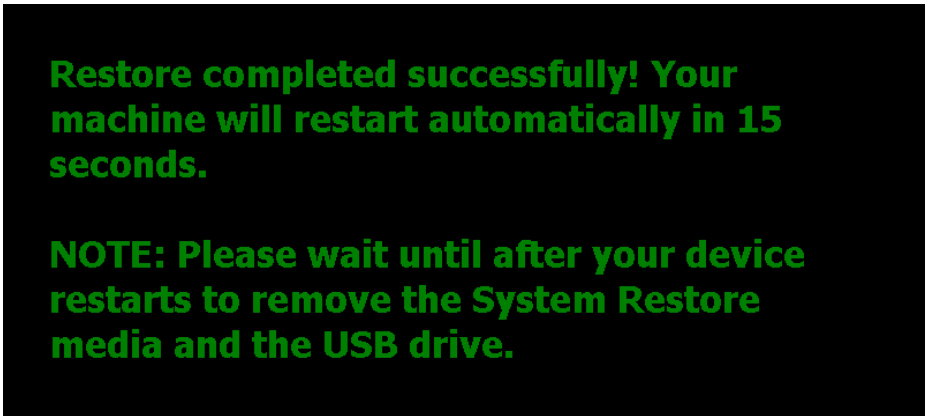


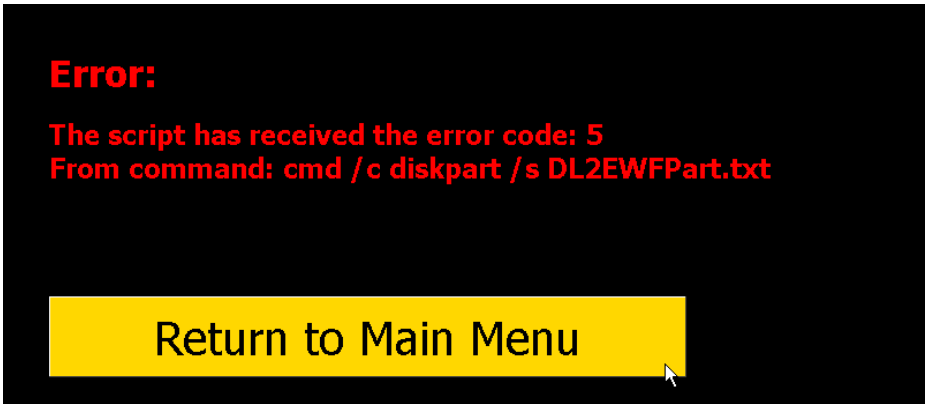
8. When this part of the restore is completed, the DL.2 will automatically restart.

9. Allow the device a few minutes to perform some OS initialization and reboot once more.

The following steps are additional steps for a full system restore only.

10. If you are performing a full system restore, you now need to re-load the DL.2 Stock content. Remove your “DL.2 System Restore CD” and insert the first “DL.2 Stock content DVD”.
11. Navigate in the DL.2 menu to the **Rst** tab. Select the 'Upgrade Content' button. You will see the filenames scroll by as the content is copied to the fixture. Wait until you see the “Upgrade Successful” message.
12. Repeat steps 9-10 for each additional Stock content DVD.
13. Once the upgrade is complete, you may remove all your external USB devices.


Restore completed successfully! Your machine will restart automatically in 15 seconds.
NOTE: Please wait until after your device restarts to remove the System Restore media and the USB drive.



Note: If you encounter an error, press the Return to Main Menu button and start the recovery process again. An error on the second attempt may indicate a hard drive failure or damaged DVD. In that case, contact High End Systems Technical Support at www.highend.com.

Appendix A:

DL.2 DMX Protocol

This table describes the Standard, Dual and Single Protocol for DL.2 fixtures.

Chan #	Function	Description		Value dec.	Value %	Default dec.	Default %
Motion and Camera Control (Standard, Dual, Single Protocol)							
Movement Functions							
1	**Pan Course**	Moves projector head from 0° to 400°		0-65535	0-100	32768	50
2	**Pan Fine**						
3	**Tilt Course**	Moves projector head from 0° to 240°		0-65535	0-100	32768	50
4	**Tilt Fine**						
5	**Dimmer**	Adjusts the mechanical iris located in front of the projector output lens from closed to open		0-255	0-100	0	0
6	**Focus**	Adjusts focus from near to far		0-255	0-100	128	50
7	**Zoom**	Adjusts zoom from narrow to wide		0-255	0-100	128	50
8	**MSpeed**	See Appendix B for conversion tables		0-255	0-100	0	0
9	**Macro**	Reserved for future use		0-255	0-100	0	0
10	**Control Function**	Safe		0-9	NA	0	0
		Fixture Movement and Camera Control Options (Set Dimmer Channel = 0 except for MSpeed Off)					
		Pan and Tilt MSpeed off		10-13	NA		
		Reserved		14-19			
		Menu Display Off (5)	*To prevent inadvertent triggering, some functions won't activate until the value has been held for a period of time.* *A number in parenthesis is the minimum number of consecutive times a DMX value must be received from a controller before the operation starts.*	20-28			
		Reserved		29			
		Menu Display Dim (5)		30-38			
		Reserved		39			
		Menu Display Bright (5)		40-48			
		Reserved		49			
		Preview		50-58			
		Reserved		59			
		Home All (20)		60-68			
		Reserved		69-79			
		Lamp ON (80)		80-88			
		Reserved		89			
		Lamp OFF (80)		90-98			
		Reserved		99-119			
		Shutdown (80)		120-130			
		Reserved		131-144			
		Graphics System Reset (80)		145-149			
		Camera Reset		150-155			

Chan #	Function	Description		Value dec.	Value %	Default dec.	Default %
10	**Control Function** (continued)	Home Pan/Tilt (20)		160-168	NA	0	0
		Reserved		169			
		Home Focus/Zoom/Iris (20)		170-178			
		Reserved		179			
		Using the Projector's Menu System					
		Projector Menu	Active Commands	180-184	NA		
		Projector Up arrow		185-188			
		Projector Down arrow		189-192			
		Projector Left arrow		193-196			
		Projector Right arrow		197-200			
		Store menu selection		201-204			
		Projector Floor Orientation		205-208			
		Projector Ceiling Orientation		209-212			
		Projector Front Projection		213-216			
		Projector Rear Projection		217-220			
		Changing Projector Inputs (Set Dimmer Channel = 0)					
		External RGBHV to Projector		221-224	NA		
		Graphics Engine to Projector (default)		225-228			
		Changing Graphics Engine Inputs (Set Dimmer Channel = 0)					
		S-Video In to Graphic Engine, Internal Camera to Camera Out		229-232	NA		
		Internal Camera to Graphics Engine (default)		233-236			
		Reserved		237-255	93-100		
Internal Camera Functions							
11 12	**Camera Zoom**	Zoom position		0-65535	0-100	32768	50
13 14	**Camera Focus**	Focus position.		0-511	0-100		
		Manual Focus from In (Far End) to Out (Near End)		512-65535		0	0
15	**Infrared Illuminator**	Camera's IR sensing off, illuminator off		0-63	0-24	0	0
		Camera's IR sensing on, illuminator off		64-127	25-49		
		Camera's IR sensing on, illuminator scaled across the range from FULL to OFF		128-255	50-100		

Chan #	Function	Description	Value dec.	Value %	Default dec.	Default %
16	**Camera Shutter**	Auto Exposure = Full Auto	0-63	0-25	0	0
		Auto Exposure = Shutter Priority, Shutter Speed = 30	64-95	26-38		
		Auto Exposure = Shutter Priority, Shutter Speed =15	96-126	39-49		
		Auto Exposure = Shutter Priority, Shutter Speed = 8	127-157	50-62		
		Auto Exposure = Shutter Priority, Shutter Speed = 4	158-188	63-74		
		Auto Exposure = Shutter Priority, Shutter Speed = 2	189-219	75-86		
		Auto Exposure = Shutter Priority, Shutter Speed = 1	220-255	87-100		
17	**White Balance Mode**	Auto Balance	0-63	0-25	0	0
		Indoor	64-95	26-38		
		Outdoor	96-127	39-49		
		Enable Manual Red and Blue gain value adjustment	128-191	50-74		
		Reserved - no change from previous state	192-255	75-100		
18	**Camera Orientation**	Flip OFF, Mirror OFF	0-63	0-25	0	0
		Flip OFF, Mirror ON	64-127	26-50		
		Flip ON, Mirror OFF	128-191	51-75		
		Flip ON, MIrror ON	192-255	76-100		
19	**Camera Effects**	Freeze Frame OFF, Negative Art, B&W OFF	0-63	0-25	0	0
		Freeze Frame ON, Negative Art, B&W OFF	64-127	26-49		
		Freeze Frame OFF, Negative Art, B&W ON	128-159	50-62		
		Freeze Frame ON, Negative Art, B&W ON	160-191	63-75		
		Freeze Frame OFF, B&W ON	192-223	76-88		
		Freeze Frame ON, B&W ON	224-255	89-100		
20	**Red Gain**	Red gain adjustment (Requires White Balance Mode = 128-191)	0-255	0-100	0	0
21	**Blue Gain**	Blue Gain adjustment (Requires White Balance Mode = 128-191)	0-255	0-100	0	0

Chan #	Function	Description	Value dec.	Value %	Default dec.	Default %
Global Functions (Standard, Dual, Single Protocol)						
22	**Global Intensity**	Selects intensity level for the composite image	0-255	0-100	255	100
Global Effects						
23	**Global Effect 1**	Off, no effects selection	0	0	0	0
		CMY simulates CMY by subtracting RGB. Reduces color values. Mod1=cyan, Mod2=magenta, Mod3 =yellow	1	NA		
		CMY adds to all pixels. Increases color values. Mod1= cyan, Mod2 =magenta, Mod3 =yellow	2			
		CMY adds to non-black pixels. Increases color values. Mod1=cyan, Mod2=magenta, Mod3= yellow	3			
		RGB Add, all pixels. Mod1=red, Mod2=green, Mod3=blue	4			
		RGB Add 2, all pixels. Mod1=red, Mod2=green, Mod3=blue	5			
		RGB Add, non-black pixels. Mod1=red, Mod2=green, Mod3= blue	6			
		RGB Swap to GBR, Mod1=red, Mod2=green, Mod3=blue.	7			
		RGB Swap to BRG, Mod1= red Mod2 =green, Mod3= blue.	8			
		Solarize 1 If color value < DMX value, invert color. Mod1=red, Mod2= green, Mod3= blue.	9			
		Solarize 2 If color value > DMX, invert color. Mod1= red, Mod2=green, Mod3=blue.	10			
		Solarize 3 If color value < DMX, set color to 0. Mod1=red, Mod2=green, Mod3=blue.	11			
		Solarize 4 If color value > DMX, set color to 0. Mod1=red, Mod2= green, Mod3 -> blue.	12			
		DotP and Resample. Mod1, Mod2 and Mod3 control resampling.	13			
		Color Cycle, DMX value controls cycle speed. Mod1= red, Mod2 = green, Mod3 = blue.	14			
		All or nothing. Mod1=red, Mod2=green, Mod3=blue. If color value > mod value, color = 255, else color = 0	15			
		Solid color RGB, Mod1=red, Mod2=green, Mod3=blue.	16			
		RGB Invert Mod1 = red to inverted red, Mod2 = green to inverted green, Mod3 = blue to inverted blue	17			

Chan #	Function	Description	Value dec.	Value %	Default dec.	Default %
23	**Global Effect 1**	RGB Invert & Swap to GBR. Mod1 = red to inverted green, Mod2 = green to inverted blue, Mod3 = blue to inverted red	18	NA	0	0
		RGB Invert & Swap to BRG. Mod1 = red to inverted blue, Mod2 = green to inverted red, Mod3 = blue to inverted green	19			
		Edge Detect Color. Mod1=horizontal size, Mod2 = vertical search size, Mod3=comparison threshold	20			
		Edge Detect B/W. Mod1=horizontal size, Mod2 = vertical search size, Mod3=comparison threshold	21			
		Texture Ripple, Horizontal Mod1=size, Mod2=rate, Mod3=offset	22			
		Texture Ripple, Vertical Mod1=size, Mod2=rate, Mod3=offset	23			
		Texture Ripple, Circular Mod1=size, Mod2=rate, Mod3=offset	24			
		Texture Ripple, Asymmetrical Circular Mod1=size, Mod2=rate, Mod3=offset	25			
		Chromakey Fine. Select key color using Mod1=red, Mod2 =green, Mod3 =blue	26			
		Chromakey Medium. Select key color using Mod1 =red, Mod2 =green, Mod3 =blue	27			
		Chromakey Coarse. Select key color using Mod1 =red, Mod2 =green, Mod3 =blue	28			
		Chromakey Inverse, Fine. Select key color using Mod1 =red, Mod2 =green, Mod3 =blue	29			
		Chromakey Inverse, Medium. Select key color using Mod1 =red, Mod2 =green, Mod3 =blue	30			
		Chromakey Inverse, Coarse. Select key color using Mod1 =red, Mod2 =green, Mod3 =blue	31			
		Scan Line. Mod1 selects scan line as texture, Mod2 fades from original image to converted image, Mod3 not used, reserved	32			
		Transparent wipes. Mod1 =width of transparent area, Mod2 =center of transparent area, Mod3=transparency mode	33			
		Pixel twist, Mod1 = x twist center, Mod2 = y twist center, Mod3 =direction and amount of twist center at 128.	34			
		Picture-in-picture, Mod1= x subpicture center, Mod2 = y subpicture center, Mod3= subpicture size	35			
		Magnifying lens, Mod1 =x lens center, Mod2 =y lens center, Mod3 lens size	36			

Chan #	Function	Description	Value dec.	Value %	Default dec.	Default %
23	**Global Effect 1**	Magnifying lens 2, Mod1= x lens center, Mod2 = y lens center, Mod3 = lens size	37	NA	0	0
		Cartoon Edge Mod1 = Edge Color, Mod2= Contrast, Mod3= Edge detection sensitivity	38			
		Color DeConverge Mod1= Moves red up, Mod2 = Moves green down and right, Mod3 = Moves blue down and left	39			
		Horizontal Mirror, Mod1 = mirror center, Mod2 and Mod3 not used	40			
		RGB Swap to BGR Mod1 = red, Mod2 = green, Mod3 = blue	41			
		RGB Swap to RBG Mod1 = red, Mod2 = green, Mod3 = blue	42			
		RGB Swap to GRB Mod1 = red, Mod2 = green, Mod3 = blue	43			
		Colorize Gray Scale maps pixel intensity to color: Mod1 = Color Scheme selection, Mod2 = Zero intensity point in color scheme, Mod3 = Fading	44			
		Intensity key turns pixels of selected intensity transparent: Mod1= Color Scheme selection, Mod2 - Intensity bandwidth, Mod3 = Controls transparency	45			
		Raindrop effect. Mod1 controls size/speed, Mod2 seeds the random number generator, and Mod3 controls raindrop rate.	46			
		RGB Scale. Mod1= scale red, Mod2=scale green, Mod3=scale blue. Maximum of Mod1, Mod2 and Mod3 sets overall color range	47			
		Reserved. Defaults to effect 0	48			
		Color to Alpha. Mod1 = red to alpha, Mod2 = green to alpha, Mod3 = blue to alpha	49			
		Color to Alpha, Inverted. Mod1 = inverted red to alpha, Mod2 = inverted green to alpha, Mod3 = inverted blue to alpha	50			
		Texture Mixing. Mod1= Source media file, Mod2= Source effect level, Mod3= Crossfade from original to source texture	51			
		Reserved. Defaults to effect 0	52-127			
		Mask color. Mod1 = red, Mod2 = green, Mod3 = blue	128			
		Edge fade color. Mod1 = red, Mod2 = green, Mod3 = blue	129			
		Mask color and Edge fade color. Mod1 = red, Mod2 = green, Mod3 = blue	130			

Chan #	Function	Description	Value dec.	Value %	Default dec.	Default %
23	**Global Effect 1**	Background Color. Mod1 = red, Mod2 = green, Mod3 = blue	131	NA	0	0
		Background Color Cycle. Mod1 = red speed, Mod2 = green speed, Mod3 = blue speed	132			
		Reserved. Defaults to effect 0	133			
		Collage. Mod1= grid style selection, Mod2=grid portion displayed, Mod3=edge blend adjustment	134			
		Corrects output for vertical convex cylinder. Mod1= correction, Mod2= adjusts vertical centerpoint, Mod3= Not used	135			
		Corrects output for vertical concave cylinder. Mod1= correction, Mod2= adjusts vertical centerpoint, Mod3= Not used	136			
		Corrects output for vertical inside corner. Mod1= correction, Mod2= adjusts vertical centerpoint, Mod3= adjusts horizontal centerpoint	137			
		Corrects output for vertical outside corner. Mod1= correction, Mod2= adjusts vertical centerpoint, Mod3= adjusts horizontal centerpoint	138			
		Curved Surface, Sphere. Mod1= correction, Mod2= adjusts vertical centerpoint, Mod3= adjusts horizontal centerpoint	139			
		Curved Surface, Convex Disk. Mod1= correction, Mod2= adjusts vertical centerpoint, Mod3= adjusts horizontal centerpoint	140			
		Reserved. Defaults to effect 0	141-255			
24	**Global Effect 1 Modifier 1**	These Modifier parameters adjust the selected Global Effect 1 parameter option from no adjustment at a DMX value of 0 to maximum adjustment at 255 (100%) The type of adjustment depends on the particular effect.	0-255	0-100	0	0
25	**Global Effect 1 Modifier 2**		0-255	0-100	0	0
26	**Global Effect 1 Modifier 3**		0-255	0-100	0	0
27	**Global Effect 2**	Off, no effects selection	0	0	0	0
		CMY simulates CMY by subtracting RGB. Reduces color values. Mod1=cyan, Mod2=magenta, Mod3 =yellow	1	NA		
		CMY adds to all pixels. Increases color values. Mod1= cyan, Mod2 =magenta, Mod3 =yellow	2			
		CMY adds to non-black pixels. Increases color values. Mod1=cyan, Mod2=magenta, Mod3= yellow	3			
		RGB Add, all pixels. Mod1=red, Mod2=green, Mod3=blue	4			

Chan #	Function	Description	Value dec.	Value %	Default dec.	Default %
27	**Global Effect 2**	RGB Add 2, all pixels. Mod1=red, Mod2=green, Mod3=blue	5	NA	0	0
		RGB Add, non-black pixels. Mod1=red, Mod2=green, Mod3= blue	6			
		RGB Swap to GBR, Mod1=red, Mod2=green, Mod3=blue.	7			
		RGB Swap to BRG, Mod1= red Mod2 =green, Mod3= blue.	8			
		Solarize 1 If color value < DMX value, invert color. Mod1=red, Mod2= green, Mod3= blue.	9			
		Solarize 2 If color value > DMX, invert color. Mod1= red, Mod2=green, Mod3=blue.	10			
		Solarize 3 If color value < DMX, set color to 0. Mod1=red, Mod2=green, Mod3=blue.	11			
		Solarize 4 If color value > DMX, set color to 0. Mod1=red, Mod2= green, Mod3 -> blue.	12			
		DotP and Resample. Mod1, Mod2 and Mod3 control resampling.	13			
		Color Cycle, DMX value controls cycle speed. Mod1= red, Mod2 = green, Mod3 = blue.	14			
		All or nothing. Mod1=red, Mod2=green, Mod3=blue. If color value > mod value, color = 255, else color = 0	15			
		Solid color RGB, Mod1=red, Mod2=green, Mod3=blue.	16			
		RGB Invert Mod1 = red to inverted red, Mod2 = green to inverted green, Mod3 = blue to inverted blue	17			
		RGB Invert & Swap to GBR. Mod1 = red to inverted green, Mod2 = green to inverted blue, Mod3 = blue to inverted red	18			
		RGB Invert & Swap to BRG. Mod1 = red to inverted blue, Mod2 = green to inverted red, Mod3 = blue to inverted green	19			
		Edge Detect Color. Mod1 =horizontal size, Mod2 = vertical search size, Mod3 =comparison threshold	20			
		Edge Detect B/W. Mod1=horizontal size, Mod2 = vertical search size, Mod3=comparison threshold	21			
		Texture Ripple, Horizontal Mod1=size, Mod2=rate, Mod3=offset	22			
		Texture Ripple, Vertical Mod1=size, Mod2=rate, Mod3=offset	23			

Chan #	Function	Description	Value dec.	Value %	Default dec.	Default %
27	**Global Effect 2**	Texture Ripple, Circular Mod1=size, Mod2=rate, Mod3=offset	24	NA	0	0
		Texture Ripple, Asymmetrical Circular Mod1=size, Mod2=rate, Mod3=offset	25			
		Chromakey Fine. Select key color using Mod1=red, Mod2 =green, Mod3 =blue	26			
		Chromakey Medium. Select key color using Mod1 =red, Mod2 =green, Mod3 =blue	27			
		Chromakey Coarse. Select key color using Mod1 =red, Mod2 =green, Mod3 =blue	28			
		Chromakey Inverse, Fine. Select key color using Mod1 =red, Mod2 =green, Mod3 =blue	29			
		Chromakey Inverse, Medium. Select key color using Mod1 =red, Mod2 =green, Mod3 =blue	30			
		Chromakey Inverse, Coarse. Select key color using Mod1 =red, Mod2 =green, Mod3 =blue	31			
		Scan Line. Mod1 selects scan line as texture, Mod2 fades from original image to converted image, Mod3 not used, reserved	32			
		Transparent wipes. Mod1 =width of transparent area, Mod2 =center of transparent area, Mod3=transparency mode	33			
		Pixel twist, Mod1 = x twist center, Mod2 = y twist center, Mod3 =direction and amount of twist center at 128.	34			
		Picture-in-picture, Mod1= x subpicture center, Mod2 = y subpicture center, Mod3= subpicture size	35			
		Magnifying lens, Mod1 =x lens center, Mod2 =y lens center, Mod3 lens size	36			
		Magnifying lens 2, Mod1= x lens center, Mod2 = y lens center, Mod3 = lens size	37			
		Cartoon Edge Mod1 = Edge Color, Mod2= Contrast, Mod3= Edge detection sensitivity	38			
		Color DeConverge Mod1= Moves red up, Mod2 = Moves green down and right, Mod3 = Moves blue down and left	39			
		Horizontal Mirror, Mod1 = mirror center, Mod2 and Mod3 not used	40			
		RGB Swap to BGR Mod1 = red, Mod2 = green, Mod3 = blue	41			
		RGB Swap to RBG Mod1 = red, Mod2 = green, Mod3 = blue	42			

Chan #	Function	Description	Value dec.	Value %	Default dec.	Default %
27	**Global Effect 2**	RGB Swap to GRB Mod1 = red, Mod2 = green, Mod3 = blue	43			
		Colorize Gray Scale maps pixel intensity to color: Mod1 = Color Scheme selection, Mod2 = Zero intensity point in color scheme, Mod3 = Fading	44			
		Intensity key turns pixels of selected intensity transparent: Mod1= Color Scheme selection, Mod2 - Intensity bandwidth, Mod3 = Controls transparency	45			
		Raindrop effect. Mod1 controls size/speed, Mod2 seeds the random number generator, and Mod3 controls raindrop rate.	46			
		Scale RGB. Mod1 = scale red, Mod2 = scale green, Mod3 = scale blue. Maximum of Mod1, Mod2 and Mod3 sets overall color range	47			
		Reserved. Defaults to effect 0	48			
		Color to Alpha. Mod1 = red to alpha, Mod2 = green to alpha, Mod3 = blue to alpha	49			
		Color to Alpha, Inverted. Mod1 = inverted red to alpha, Mod2 = inverted green to alpha, Mod3 = inverted blue to alpha	50			
		Texture Mixing. Mod1= Source media file, Mod2= Source effect level, Mod3= Crossfade from original to source texture	51			
		Reserved. Defaults to effect 0	52-127			
		Mask color. Mod1 = red, Mod2 = green, Mod3 = blue	128			
		Edge fade color. Mod1 = red, Mod2 = green, Mod3 = blue	129			
		Mask color and Edge fade color. Mod1 = red, Mod2 = green, Mod3 = blue	130			
		Background Color. Mod1 = red, Mod2 = green, Mod3 = blue	131			
		Background Color Cycle. Mod1 = red speed, Mod2 = green speed, Mod3 = blue speed	132			
		Reserved. Defaults to effect 0	133			
		Collage. Mod1= grid style selection, Mod2=grid portion displayed, Mod3=edge blend adjustment	134			
		Curved Surface, Vertical convex cylinder. Mod1= correction, Mod2= adjusts vertical centerpoint, Mod3= Not used	135			
		Curved Surface, Vertical concave cylinder. Mod1= correction, Mod2= adjusts vertical centerpoint, Mod3= Not used	136			

Chan #	Function	Description	Value dec.	Value %	Default dec.	Default %
27	**Global Effect 2**	Curved Surface, Vertical inside corner. Mod1= correction, Mod2= adjusts vertical centerpoint, Mod3= adjusts horizontal centerpoint	137			
		Curved Surface, Vertical outside corner. Mod1= correction, Mod2= adjusts vertical centerpoint, Mod3= adjusts horizontal centerpoint	138			
		Curved Surface, Sphere. Mod1= correction, Mod2= adjusts vertical centerpoint, Mod3= adjusts horizontal centerpoint	139			
		Curved Surface, Convex Disk. Mod1= correction, Mod2= adjusts vertical centerpoint, Mod3= adjusts horizontal centerpoint	140			
		Reserved. Defaults to effect 0	141-255			
		Reserved. Defaults to effect 0	133	NA	0	0
		Collage. Mod1= grid style selection, Mod2=grid portion displayed, Mod3=edge blend adjustment	134			
		Reserved. Defaults to effect 0	135-255			
28	**Global Effect 2 Modifier 1**	These Modifier parameters adjust the selected Global Effect 2 parameter option from no adjustment at a DMX value of 0 to maximum adjustment at 255 (100%) The type of adjustment depends on the particular effect.	0-255	0-100	0	0
29	**Global Effect 2 Modifier 2**		0-255	0-100	0	0
30	**Global Effect 2 Modifier 3**		0-255	0-100	0	0
Global Mask						
31	**Mask Select**	***Static Masks***			0	0
		Round *iris* closing from outside in	0	0		
		Round *iris* closing from inside out	1	NA		
		Rectangle closing from outside in	2			
		Rectangle closing from inside out	3			
		Checkerboard, variation 1	4			
		Checkerboard, variation 2	5			
		Radial wipe, variation 1	6			
		Radial wipe, variation 2	7			
		Radial wipe, variation 3	8			
		Radial wipe, variation 4	9			
		Triangles, variation 1	10			
		Triangles, variation 2	11			
		Rectangular wrap	12			
		Tiles closing in	13			
		Horizontal doors, closing	14			
		Horizontal doors closing from opposing sides	15			

Chan #	Function	Description	Value dec.	Value %	Default dec.	Default %
31	**Mask Select**	Vertical doors closing from outside in	16	NA	0	0
		Vertical wipe closing from inside out	17			
		Rectangular tiles closing from inside out 1	18			
		Rectangular tiles closing from inside out 2	19			
		Vertical panels closing from outside in 1	20			
		Vertical panels closing from outside in 2	21			
		Vertical diamonds 1	22			
		Vertical diamonds 2	23			
		Horizontal diamonds 1	24			
		Horizontal diamonds 2	25			
		Pinwheel	26			
		Oval Iris closing from outside in	27			
		Oval Iris closing from inside out	28			
		Oscillating iris closing from outside in	29			
		Artistic Iris	30			
		Reserved for other installed masks, defaults to 0	31-127			
		Strobing Masks				
		Periodic strobe, round “iris” mask closing from outside in.	128			
		Round *iris* closing from inside out	129			
		Rectangle closing from outside in	130			
		Rectangle closing from inside out	131			
		Checkerboard, variation 1	132			
		Checkerboard, variation 2	133			
		Radial wipe, variation 1	134			
		Radial wipe, variation 2	135			
		Radial wipe, variation 3	136			
		Radial wipe, variation 4	137			
		Triangles, variation 1	138			
		Triangles, variation 2	139			
		Rectangular wrap	140			
		Tiles closing in	141			
		Horizontal doors, closing	142			
		Horizontal doors closing from opposing sides	143			
		Vertical doors closing from outside in	144			
		Vertical wipe closing from inside out	145			
		Rectangular tiles closing from inside out 1	146			
		Rectangular tiles closing from inside out 2	147			
		Vertical panels closing from outside in 1	148			

Chan #	Function	Description	Value dec.	Value %	Default dec.	Default %
31	**Mask Select**	Vertical panels closing from outside in 2	149	NA	0	0
		Vertical diamonds 1	150			
		Vertical diamonds 2	151			
		Horizontal diamonds 1	152			
		Horizontal diamonds 2	153			
		Pinwheel	154			
		Oval Iris closing from outside in	155			
		Oval Iris closing from inside out	156			
		Oscillating iris closing from outside in	157			
		Animated Dynamic Iris	158			
		Reserved for other strobing installed masks	159-255			
32	**Mask Size**	Adjusts mask size from fully closed to open	0-255	0-100	255	100
33	**Mask Edge Fade**	Hard edge to faded edge when Mask Select=0-127. Strobe rate control from Fastest to slowest when Mask Select parameter value = 128-255	0-255	0-100	0	0
Global Image Edge Fade						
34	**Image Edge Fade, Top**	Adjusts the image's top edge diffusion from hard edge (0) to maximum fade (255)	0-255	0-100	0	0
35	**Image Edge Fade, Right**	Adjusts the image's right edge diffusion from hard edge (0) to maximum fade (255)	0-255	0-100	0	0
36	**Image Edge Fade, Bottom**	Adjusts the image's bottom edge diffusion from hard edge (0) to maximum fade (255)	0-255	0-100	0	0
37	**Image Edge Fade, Left**	Adjusts the image's left edge diffusion from hard edge (0) to maximum fade (255)	0-255	0-100	0	0
Global Keystone Correction						
38	**Top Left X**	Move top left corner x value to center	0-255	0-100	0	0
39	**Top Left Y**	Move top left corner y value to center	0-255	0-100	0	0
40	**Top Right X**	Move top right corner x value to center	0-255	0-100	0	0
41	**Top Right Y**	Move top right corner y value to center	0-255	0-100	0	0
42	**Bottom Right X**	Move bottom right corner x value to center	0-255	0-100	0	0
43	**Bottom Right Y**	Move bottom right corner y value to center	0-255	0-100	0	0
44	**Bottom Left X**	Move bottom left corner x value to center	0-255	0-100	0	0
45	**Bottom Left Y**	Move bottom left corner y value to center	0-255	0-100	0	0
46	**X Ratio**	Shifts the image density along the X-axis	0-255	0-100	128	50
47	**Y Ratio**	Shifts the image density along the Y-axis	0-255	0-100	128	50

Chan #	Function	Description	Value dec.	Value %	Default dec.	Default %
Global Viewpoint						
48	**Viewpoint Mode**	***Perspective View, Spherical Coordinates***			0	0
		Look at point: center of universe	0	0		
		Look at point: graphic 1	1	NA		
		Look at point: graphic 2	2			
		Look at point: graphic 3	3			
		Perspective View, Cartesian Coordinates				
		Look at point: center of universe	4	0		
		Look at point: graphic 1	5	NA		
		Look at point: graphic 2	6			
		Look at point: graphic 3	7			
		Orthogonal View, Cartesian Coordinates				
		Look at point: center of universe	8	0		
		Look at point: graphic 1	9	NA		
		Look at point: graphic 2	10			
		Look at point: graphic 3	11			
		Reserved	12-255			
49	**Viewpoint Position X**	Maximum horizontal angle clockwise	0	0-	32768	50
50		Center	32768	50		
		Maximum horizontal angle counterclockwise	65535	100		
51	**Viewpoint Position Y**	Maximum Vertical angle clockwise	0	0-	32768	50
52		Center	32768	50		
		Maximum Vertical angle counterclockwise	65535	100		
53	**Viewpoint Position Z (Zoom)**	Maximum distance from origin in front of view target	0	0	30260	49
54		Center	32768	50		
		Maximum distance from origin behind view target	65535	100		
55	**Global Control**	No control selected. Safe	0	0	0	0
		Reserved	1-252	NA		
		Four-in-one displays each layers output and combined output in a 2 x 2 array.	253			
		Reserved	254			
		On-screen Statistics	255			
		Reserved	4-255			

Chan #	Function	Description	Value dec.	Value %	Default dec.	Default %
56	**Global Control Modifer**	***Four-in-one Combined Quadrant (Channel 55 = 253)***				
		Displays the selected media file for each graphic object plus the final composite image	0-9			
		Displays the selected media file for each graphic object plus the final composite image and the image's position in an applied collage effect	10-19			
		Displays the current media file for each graphic object plus the final composite image with the result of an applied collage effect and curved surface adjustment.	20-30			
		Displays the media file for each graphic object plus the first effect applied to it (if any).	31			
		Displays the media file for each graphic object with up to two effects applied to it.	32			
		Displays the media file for each graphic object with up to the first three effects applied to it.	33			
		Reserved	34-255			
		On-screen Frame Statistics (Channel 55 = 255)				
		Text color = gray	0	NA		
		Text color = red	1			
		Text color = blue	2			
		Text color = green	3			

Chan #	Function	Description	Value dec.	Value %	Default dec.	Default %
Graphic 1 Functions (Standard, Dual, Single Protocol)						
57	**Opacity**	Selects transparency level from completely transparent (0) to opaque (255)	0-255	0-100	0	0
Graphic 1 Content Definition						
58	**3-D Object File**	No selection	0	0	1	1
		First Stock 3-D Object (flat plane)	1	1		
		Additional Stock 3-D Objects	2-149	NA		
		First User 3-D Objects	150			
		Additional User Objects	151-255			
59	**Media Folder**	No selection	0	NA	0	0
		HES Folder 1	1			
		HES Folders 2- 40	2-40			
		First User Folder 41	41			
		User Folders 42-239	42-239			
		Reserved	240-254			
		Integrated video camera capture. The Media File parameter is ignored	255			
60	**Media File**	No selection	0	0	0	0
		First Media File	1	NA		
		Additional Media Files 2-255	2-255			
61 62	**In Frame**	Defines the beginning of a media file segment as a percentage of the movie length	0-65535	0-100	0	0
63 64	**Out Frame**	Defines the end of a Media File segment as a percentage of the movie length	0-65535	0-100	65535	100
65	**Play Mode**	Play forward looping continuously	0	0	0	0
		Play forward once and hold on the last frame	1	NA		
		Pause	2			
		Play forward if opacity > 0, hold on last frame	3			
		Play forward if opacity > 0, looping continuously	4			
		Pause and rewind to In Frame	5			
		Scrub (Display) the selected In Frame	6			
		Scrub (Display) the selected Out Frame	7			
		Scrub (Display) the selected In Frame with statistics	8			
		Scrub (Display) the selected Out Frame with statistics	9			
		Reserved	10-255	3-100		

Chan #	Function	Description	Value dec.	Value %	Default dec.	Default %
66	**Play Speed**	Normal Speed	0	0	128	50
		Slow speeds from slowest toward normal	1-127	1-49		
		Normal Speed	128	50		
		Faster than Normal to Fastest	129-255	51-100		
Graphic 1 Synchronization						
67	**Sync Mode**	No selection	0	0	0	0
		Synch to Graphic 1 movie time	1	NA		
		Synch to Graphic 2 movie time	2			
		Synch to Graphic 3 movie time	3			
		Synch to Object rotation 1	4			
		Synch to Object rotation 2	5			
		Synch to Object rotation 3	6			
		Synch to reverse Object rotation 1	7			
		Synch to reverse Object rotation 2	8			
		Synch to reverse Object rotation 3	9			
		Synch to Graphic movie time and rotation 1	10			
		Synch to Graphic movie time and rotation 2	11			
		Synche to Graphic movie time and rotation 3	12			
		Synch to Graphic movie time + reverse rotation 1	13			
		Synch to Graphic movie time + reverse rotation 2	14			
		Synch to Graphic movie time + reverse rotation 3	15			
		Reserved. Defaults to mode 0, no selection.	16- 255			
68	**Sync To**	No Selection	0	NA	0	0
		Sync to Fixture ID Number 1	1			
		Sync to Fixture ID Number 2 . . . Sync to Fixture Number 254	2 . . . 254			
		Sync to Fixture ID Number 255	255			
Graphic 1 Effects						
69	**Visual Mode**	Off. No visual mode processing applied to output.	0	NA	1	1
		Content Optimization Mod1=black level, Mod2=contrast.	1			
		Sepia tones. Mod1 fades from original color to sepia colors. Mod2 controls saturation.	2			
		Red tones. Mod1 fades from original color to red tones. Mod2 controls saturation.	3			
		Gray maker. Mod1 compresses colors to shades of gray. Mod2 adjusts contrast	4			

Chan #	Function	Description	Value dec.	Value %	Default dec.	Default %
69	**Visual Mode**	Gray maker2. Always gray. Mod1 = brightness, Mod2 = contrast	5	NA	1	1
		Posterizer. Mod1 reduces color detail. Mod2 adjusts contrast.	6			
		Color to Black & White. Mod1 fades color RGB @0 to B/W @50% to white @100%. Mod2= not used.	7			
		Fire Gradient, Mod1fades original to converted Mod2 not used, reserved.	8			
		Negative Art. Mod1 fades from original image to converted image, Mod2 subtracts red from 0-128, subtracts green from 129-255.	9			
		Exposure Control. Mod1 adjusts color contrast, Mod2 adjusts color shift	10			
		Invert B&W, Keep Color. Mod1 = black comparison level, Mod2= white comparison level	11			
		Texture Mixing. Mod1= Source media file, Mod2= Crossfade from original to source texture	12			
		Reserved, defaults to 0ff	13-255			
70	**Visual Mode Modifier 1**	Adjusts selected Visual Mode from 0 to maximum	0-255	0-100	0	0
71	**Visual Mode Modifier 2**	Adjusts selected Visual Mode from 0 to maximum	0-255	0-100	0	0
72	**Effect Mode 1**	Off, no effects selection	0	0	0	0
		CMY simulates CMY by subtracting RGB (reduces color values) Mod1 = cyan, Mod2 = magenta, Mod3 = yellow	1	NA		
		CMY Add to All Pixels increases color values. Mod1 = cyan, Mod2 = magenta, Mod3 = yellow	2			
		CMY Add to Non-black Pixels increases color values. Mod1 = cyan, Mod2 = magenta, Mod3 = yellow	3			
		RGB Add All Pixels. Mod1 = red, Mod2 = green, Mod3 = blue	4			
		RGB Add 2 All Pixels. Mod1 = red, Mod2 = green, Mod3 = blue	5			
		RGB Add, non-black pixels. Mod1 = red, Mod2 = green, Mod3 = blue	6			
		RGB Swap to GBR Mod1 = red, Mod2 = green, Mod3 = blue.	7			
		RGB Swap to BGR Mod1 = red, Mod2 = green, Mod3 = blue.	8			
		Solarize 1 (if color value < DMX value, invert color) Mod1 = red, Mod2 = green, Mod3 = blue.	9			

Chan #	Function	Description	Value dec.	Value %	Default dec.	Default %
72	**Effect Mode 1**	Solarize 2 (if color value > DMX, invert color) Mod1 = red, Mod2 = green, Mod3 = blue.	10	NA	0	0
		Solarize (if color value < DMX, set color to 0) Mod1 = red, Mod2 = green, Mod3 = blue.	11			
		Solarize 4 (if color value > DMX, set color to 0) Mod1 = red, Mod2 = green, Mod3 = blue.	12			
		DotP and Resample Mod1, Mod2 and Mod3 control resampling.	13			
		Color Cycle (DMX value controls cycle speed) Mod1 = red, Mod2 = green, Mod3 = blue.	14			
		All or Nothing (Color value greater than Mod value, color = 255, else color = 0) Mod1 = red, Mod2 = green, Mod3 = blue.	15			
		Solid Color RGB Mod1 = red, Mod2 = green, Mod3 = blue.	16			
		RGB Invert Mod1 = red to inverted red, Mod2 = green to inverted green, Mod3 = blue to inverted blue	17			
		RGB Invert & Swap to GBR Mod1 = red to inverted green, Mod2 = green to inverted blue, Mod3 = blue to inverted red	18			
		RGB Invert & Swap to BRG Mod1 = red to inverted blue, Mod2 = green to inverted red, Mod3 = blue to inverted green	19			
		Edge Detect Color Mod1=horizontal size, Mod2 = vertical search size, Mod3=comparison threshold	20			
		Edge Detect B/W Mod1=horizontal size, Mod2 = vertical search size, Mod3=comparison threshold	21			
		Texture Ripple, Horizontal Mod1=size, Mod2=rate, Mod3=offset	22			
		Texture Ripple, Vertical Mod1=size, Mod2=rate, Mod3=offset	23			
		Texture Ripple, Circular Mod1=size, Mod2=rate, Mod3=offset	24			
		Texture Ripple, Asymmetrical Circular Mod1=size, Mod2=rate, Mod3=offset	25			
		Chromakey Fine. Select key color using Mod1=red, Mod2 =green, Mod3 =blue	26			
		Chromakey Medium. Select key color using Mod1 =red, Mod2 =green, Mod3 =blue	27			
		Chromakey Coarse. Select key color using Mod1 =red, Mod2 =green, Mod3 =blue	28			
		Chromakey Inverse, Fine. Select key color using Mod1 =red, Mod2 =green, Mod3 =blue	29			

Chan #	Function	Description	Value dec.	Value %	Default dec.	Default %
72	**Effect Mode 1**	Chromakey Inverse, Medium. Select key color using Mod1 =red, Mod2 =green, Mod3 =blue	30	NA	0	0
		Chromakey Inverse, Coarse. Select key color using Mod1 =red, Mod2 =green, Mod3 =blue	31			
		Scan Line: Mod1 selects scan line as texture, Mod2 fades from original image to converted image, Mod3 not used, reserved	32			
		Transparent Wipes: Mod1 =width of transparent area, Mod2 =center of transparent area, Mod3=transparency mode	33			
		Pixel Twist Mod1 = x twist center, Mod2 = y twist center, Mod3 =direction and amount of twist	34			
		Picture-in-Picture Mod1= x subpicture center, Mod2 = y subpicture center, Mod3= subpicture size	35			
		Magnifying Lens Mod1 =x lens center, Mod2 =y lens center, Mod3=lens size	36			
		Magnifying Lens 2 Mod1= x lens center, Mod2 = y lens center, Mod3 = lens size	37			
		Cartoon Edge Mod1 = Edge Color, Mod2= Contrast, Mod3= Edge detection sensitivity	38			
		Color DeConverge Mod1= Moves red up, Mod2 = Moves green down and right, Mod3 = Moves blue down and left	39			
		Horizontal Mirror, Mod1 = mirror center, Mod2 and Mod3 not used	40			
		RGB Swap to BGR Mod1 = red, Mod2 = green, Mod3 = blue	41			
		RGB Swap to RBG Mod1 = red, Mod2 = green, Mod3 = blue	42			
		RGB Swap to GRB Mod1 = red, Mod2 = green, Mod3 = blue	43			
		Colorize Gray Scale maps pixel intensity to color: Mod1 = Color Scheme selection, Mod2 = Zero intensity point in color scheme, Mod3 = Fading	44			
		Intensity key turns pixels of selected intensity transparent: Mod1= Color Scheme selection, Mod2 - Intensity bandwidth, Mod3 = Controls transparency	45			
		Raindrop effect. Mod1 controls size/speed, Mod2 seeds the random number generator, and Mod3 controls raindrop rate.	46			

Chan #	Function	Description	Value dec.	Value %	Default dec.	Default %
72	**Effect Mode 1**	Scale RGB. Mod1= scale red, Mod2=scale green, Mod3=scale blue. Maximum of Mod1, Mod2 and Mod3 sets overall color range	47	NA	0	0
		Tiling On (Scaler of 128=1 to 1) *Note: Tiling on Mode 1 overrides tiling on Effect Mode 2* Mod1=x-axis tiling scaler, Mod2=y-axis tiling scaler. Mod3 not used.	48			
		Color to Alpha. Mod1 = red to alpha, Mod2 = green to alpha, Mod3 = blue to alpha	49			
		Color to Alpha, Inverted. Mod1 = inverted red to alpha, Mod2 = inverted green to alpha, Mod3 = inverted blue to alpha	50			
		Texture Mixing. Mod1= Source media file, Mod2= Source effect level, Mod3= Crossfade from original to source texture	51			
		Reserved. Defaults to effect 0	52-63			
		Sinewave, Circular with Y-axis Wobbulation Mod1=size, Mod2=rate, Mod3=offset	64			
		Sinewave, Circular with Y-axis Wobbulation Mod1=size, Mod2=rate, Mod3=offset	65			
		Sinewave, Circular with Z-axis Wobbulation Mod1=size, Mod2=rate, Mod3=offset	66			
		Sinewave, Horizontal with X-axis Wobbulation Mod1=size, Mod2=rate, Mod3=offset	67			
		Sinewave, Horizontal with Y-axis Wobbulation Mod1=size, Mod2=rate, Mod3=offset	68			
		Sinewave, Horizontal with Z-axis Wobbulation Mod1=size, Mod2=rate, Mod3=offset	69			
		Sinewave, Vertical with X-axis Wobbulation Mod1=size, Mod2=rate, Mod3=offset	70			
		Sinewave, Vertical with Y-axis Wobbulation Mod1=size, Mod2=rate, Mod3=offset	71			
		Sinewave, Vertical with Z-axis Wobbulation Mod1=size, Mod2=rate, Mod3=offset	72			
		Glow: Mod1=red, Mod2= green, Mod3=blue	73			
		Glow Color Cycle: Mod1= red cycle speed, Mod2= green cycle speed, Mod3= blue cycle speed	74			
		Reserved, defaults to Effect 0	75-255			
73	**Effect Mode 1 Modifier 1**	Adjusts effect selected in Effect Mode 1 from no adjustment at a DMX value of 0 to maximum adjustment at 255 (100%). The type of adjustment depends on the effect. *Note: for some effects, one or more modifiers may not be used.*	0-255	1-100	0	0
74	**Effect Mode 1 Modifier 2**		0-255	1-100	0	0
75	**Effect Mode 1 Modifier 3**		0-255	1-100	0	0

Chan #	Function	Description	Value dec.	Value %	Default dec.	Default %
76	**Effect Mode 2**	Off, no effects selection		NA	0	0
		CMY simulates CMY by subtracting RGB (reduces color values) Mod1 = cyan, Mod2 = magenta, Mod3 = yellow	1			
		CMY Add to All Pixels increases color values. Mod1 = cyan, Mod2 = magenta, Mod3 = yellow	2			
		CMY Add to Non-black Pixels increases color values. Mod1 = cyan, Mod2 = magenta, Mod3 = yellow	3			
		RGB Add All Pixels. Mod1 = red, Mod2 = green, Mod3 = blue	4			
		RGB Add 2 All Pixels. Mod1 = red, Mod2 = green, Mod3 = blue	5			
		RGB Add, non-black pixels. Mod1 = red, Mod2 = green, Mod3 = blue	6			
		RGB Swap to GBR Mod1 = red, Mod2 = green, Mod3 = blue.	7			
		RGB Swap to BGR Mod1 = red, Mod2 = green, Mod3 = blue.	8			
		Solarize 1 (if color value < DMX value, invert color) Mod1 = red, Mod2 = green, Mod3 = blue.	9			
		Solarize 2 (if color value > DMX, invert color) Mod1 = red, Mod2 = green, Mod3 = blue.	10			
		Solarize (if color value < DMX, set color to 0) Mod1 = red, Mod2 = green, Mod3 = blue.	11			
		Solarize 4 (if color value > DMX, set color to 0) Mod1 = red, Mod2 = green, Mod3 = blue.	12			
		DotP and Resample Mod1, Mod2 and Mod3 control resampling.	13			
		Color Cycle (DMX value controls cycle speed) Mod1 = red, Mod2 = green, Mod3 = blue.	14			
		All or Nothing (Color value greater than Mod value, color = 255, else color = 0) Mod1 = red, Mod2 = green, Mod3 = blue.	15			
		Solid Color RGB Mod1 = red, Mod2 = green, Mod3 = blue.	16			
		RGB Invert Mod1 = red to inverted red, Mod2 = green to inverted green, Mod3 = blue to inverted blue	17			
		RGB Invert & Swap to GBR Mod1 = red to inverted green, Mod2 = green to inverted blue, Mod3 = blue to inverted red	18			
		RGB Invert & Swap to BRG Mod1 = red to inverted blue, Mod2 = green to inverted red, Mod3 = blue to inverted green	19			

Chan #	Function	Description	Value dec.	Value %	Default dec.	Default %
76	**Effect Mode 2**	Edge Detect Color Mod1=horizontal size, Mod2 = vertical search size, Mod3=comparison threshold	20	NA	0	0
		Edge Detect B/W Mod1=horizontal size, Mod2 = vertical search size, Mod3=comparison threshold	21			
		Texture Ripple, Horizontal Mod1=size, Mod2=rate, Mod3=offset	22			
		Texture Ripple, Vertical Mod1=size, Mod2=rate, Mod3=offset	23			
		Texture Ripple, Circular Mod1=size, Mod2=rate, Mod3=offset	24			
		Texture Ripple, Asymmetrical Circular Mod1=size, Mod2=rate, Mod3=offset	25			
		Chromakey Fine. Select key color using Mod1=red, Mod2 =green, Mod3 =blue	26			
		Chromakey Medium. Select key color using Mod1 =red, Mod2 =green, Mod3 =blue	27			
		Chromakey Coarse. Select key color using Mod1 =red, Mod2 =green, Mod3 =blue	28			
		Chromakey Inverse, Fine. Select key color using Mod1 =red, Mod2 =green, Mod3 =blue	29			
		Chromakey Inverse, Medium. Select key color using Mod1 =red, Mod2 =green, Mod3 =blue	30			
		Chromakey Inverse, Coarse. Select key color using Mod1 =red, Mod2 =green, Mod3 =blue	31			
		Scan Line: Mod1 selects scan line as texture, Mod2 fades from original image to converted image, Mod3 not used, reserved	32			
		Transparent Wipes: Mod1 =width of transparent area, Mod2 =center of transparent area, Mod3=transparency mode	33			
		Pixel Twist Mod1 = x twist center, Mod2 = y twist center, Mod3 =direction and amount of twist	34			
		Picture-in-Picture Mod1= x subpicture center, Mod2 = y subpicture center, Mod3= subpicture size	35			
		Magnifying Lens Mod1 =x lens center, Mod2 =y lens center, Mod3=lens size	36			
		Magnifying Lens 2 Mod1= x lens center, Mod2 = y lens center, Mod3 = lens size	37			

Chan #	Function	Description	Value dec.	Value %	Default dec.	Default %
76	**Effect Mode 2**	Cartoon Edge. Mod1 = Edge Color, Mod2= Contrast, Mod3= Edge detection sensitivity	38	NA	0	0
		Color DeConverge Mod1= Moves red up, Mod2 = Moves green down and right, Mod3 = Moves blue down and left	39			
		RGB Swap to BGR Mod1 = red, Mod2 = green, Mod3 = blue	41			
		RGB Swap to RBG Mod1 = red, Mod2 = green, Mod3 = blue	42			
		RGB Swap to GRB Mod1 = red, Mod2 = green, Mod3 = blue	43			
		Colorize Gray Scale maps pixel intensity to color: Mod1 = Color Scheme selection, Mod2 = Zero intensity point in color scheme, Mod3 = Fading	44			
		Intensity key turns pixels of selected intensity transparent: Mod1= Color Scheme selection, Mod2 - Intensity bandwidth, Mod3 = Controls transparency	45			
		Raindrop effect. Mod1 controls size/speed, Mod2 seeds the random number generator, and Mod3 controls raindrop rate.	46			
		Scale RGB. Mod1= scale red, Mod2=scale green, Mod3=scale blue. Maximum of Mod1, Mod2 and Mod3 sets overall color range	47			
		Tiling On (Scaler of 128=1 to 1) *Note: Tiling on Mode 1 overrides tiling on Effect Mode 2* Mod1=x-axis tiling scaler, Mod2=y-axis tiling scaler. Mod3 not used.	48			
		Color to Alpha. Mod1 = red to alpha, Mod2 = green to alpha, Mod3 = blue to alpha	49			
		Color to Alpha, Inverted. Mod1 = inverted red to alpha, Mod2 = inverted green to alpha, Mod3 = inverted blue to alpha	50			
		Texture Mixing. Mod1= Source media file, Mod2= Source effect level, Mod3= Crossfade from original to source texture	51			
		Reserved. Defaults to effect 0	52-63			
		Sinewave, Circular with Y-axis Wobbulation Mod1=size, Mod2=rate, Mod3=offset	64			
		Sinewave, Circular with Y-axis Wobbulation Mod1=size, Mod2=rate, Mod3=offset	65			
		Sinewave, Circular with Z-axis Wobbulation Mod1=size, Mod2=rate, Mod3=offset	66			
		Sinewave, Horizontal with X-axis Wobbulation Mod1=size, Mod2=rate, Mod3=offset	67			
		Sinewave, Horizontal with Y-axis Wobbulation Mod1=size, Mod2=rate, Mod3=offset	68			

Chan #	Function	Description	Value dec.	Value %	Default dec.	Default %
76	**Effect Mode 2**	Sinewave, Horizontal with Z-axis Wobbulation Mod1=size, Mod2=rate, Mod3=offset	69	NA	0	0
		Sinewave, Vertical with X-axis Wobbulation Mod1=size, Mod2=rate, Mod3=offset	70			
		Sinewave, Vertical with Y-axis Wobbulation Mod1=size, Mod2=rate, Mod3=offset	71			
		Sinewave, Vertical with Z-axis Wobbulation Mod1=size, Mod2=rate, Mod3=offset	72			
		Glow: Mod1=red, Mod2= green, Mod3=blue	73			
		Glow Color Cycle: Mod1= red cycle speed, Mod2= green cycle speed, Mod3= Blue cycle speed	74			
		Reserved, defaults to Effect 0	75-255			
77	**Effect Mode 2 Modifier 1**	Adjusts effect selected in Effect Mode 1 from no adjustment at a DMX value of 0 to maximum adjustment at 255 (100%). The type of adjustment depends on the effect. *Note: for some effects, one or more modifiers may not be used.*	0-255	1-100	0	0
78	**Effect Mode 2 Modifier 2**		0-255	1-100	0	0
79	**Effect Mode 2 Modifier 3**		0-255	1-100	0	0
Graphic 1 Rotation						
80	**X-axis Rotation** *(vertical flip, 16-bit adjustment)*	Continuous variable-speed counterclockwise object rotation around X-axis (fast to slow)	0-16382	0-24	32768	50
		Continuous rotation stop	16383	25		
		Rotates the object counterclockwise around X-axis in steps to -720 degrees absolute	16384-32767	26-49		
81		0° rotation around X-axis	32768	50		
		Rotates the object clockwise around X-axis in steps to 720 degrees absolute	32769-49151	51-74		
		Continuous rotation stop	49152	75		
		Continuous variable-speed clockwise object rotation around X-axis (slow to fast)	49154-65535	76-100		
82	**Y-axis Rotation** *(horizontal flip, 16-bit adjustment)*	Continuous variable-speed counterclockwise object rotation around Y-axis (fast to slow)	0-16382	0-24	32768	50
		Continuous rotation stop	16383	25		
		Rotates the object counterclockwise around Y-axis in steps to -720 degrees absolute	16384-32767	26-49		
83		0° rotation around Y-axis	32768	50		
		Rotates the object clockwise around Y-axis in steps to 720 degrees absolute	32769-49151	51-74		
		Continuous rotation stop	49152	75		
		Continuous variable-speed clockwise object rotation around Y-axis (slow to fast)	49154-65535	76-100		

Chan #	Function	Description	Value dec.	Value %	Default dec.	Default %
84 85	**Z-axis Rotation** *(circular 16-bit adjustment)*	Continuous variable-speed counterclockwise object rotation around Z axis (fast to slow)	0-16382	0-24	32768	50
		Continuous rotation stop	16383	25		
		Rotates the object counterclockwise around Z-axis in steps to -720 degrees absolute	16384-32767	26-49		
		0° rotation around Z-axis	32768	50		
		Rotates the object clockwise around Z-axis in steps to 720 degrees absolute	32769-49151	51-74		
		Continuous rotation stop	49152	75		
		Continuous variable-speed clockwise object rotation around Z axis (slow to fast)	49154-65535	76-100		
Graphic 1 Scaling						
86	**Scale X**	Minimum object size along X axis (1:10)	0	0	128	50
		Increases object size along X axis from minimum to actual size	1-127	1-49		
		Actual size along X axis (1:1)	128	50		
		Increases object size along X axis from actual to maximum size	129-254	51-99		
		Maximum object size along X axis (10:1)	255	100		
87	**Scale Y**	Minimum object size along Y axis (1:10)	0	0	128	50
		Increases object size along Y axis from minimum to actual size	1-127	1-49		
		Actual size along Y axis (1:1)	128	50		
		Increases object size along Y axis from actual to maximum size	129-254	51-99		
		Maximum object size along Y axis (10:1)	255	100		
88	**Scale Z**	Minimum object size along Z axis (1:10)	0	0	128	50
		Increases object size along Z axis from minimum to actual size	1-127	1-49		
		Actual size along Z axis (1:1)	128	50		
		Increases object size along Z axis from actual to maximum size	129-254	51-99		
		Maximum object size along Z axis (10:1)	255	100		

Chan #	Function	Description	Value dec.	Value %	Default dec.	Default %
Graphic 1 Position						
89	**X-Position**	Moves object left from center of display	0-36767	0-49	32768	50
		Centers object along X axis in display	32768	50		
90		Moves object right from center of display	36769-65535	51-100		
91	**Y-Position**	Moves object down from center of display	0-36767	0-49	32768	50
		Centers object along Y axis in display	32768	50		
92		Moves object up from center of display	36769-65535	51-100		
93	**Z-Position**	Moves object nearer from center of display	0-36767	0-49	32768	50
		Centers object along Z axis in display	32768	50		
94		Moves object back along Z axis at center of display	36769-65535	51-100		

Chan #	Function	Description	Value dec.	Value %	Default dec.	Default %
Graphic 2 Functions (Standard, Dual)						
95	**Opacity**	Selects transparency level from completely transparent (0) to opaque (255)	0-255	0-100	255	100
Graphic 2 Content Definition						
96	**3-D Object File**	No selection	0	0	1	1
		First Stock 3-D Object (flat plane)	1	1		
		Additional Stock 3-D Objects	2-149	NA		
		First User 3-D Objects	150			
		Additional User Objects	151-255			
97	**Media Folder**	No selection	0	NA	0	0
		HES Folder 1	1			
		HES folder 2- 40	2-40			
		First User folder 41	41			
		User Folders 42-239	42-239			
		Reserved	240-254			
		Integrated video camera capture. The Media File parameter is ignored	255			
98	**Media File**	No selection	0	0	0	0
		First Media File	1	NA		
		Additional Media Files 2-255	2-255			
99 100	**In Frame**	Defines the beginning of a Media File segment as a percentage of the movie length	0-65535	0-100	0	0
101 102	**Out Frame**	Defines the end of a Media File segment as a percentage of the movie length	0-65535	0-100	65535	100
103	**Play Mode**	Play forward looping continuously	0	0	0	0
		Play forward once and hold on the last frame	1	NA		
		Pause	2			
		Play forward if opacity > 0, hold on last frame	3			
		Play forward if opacity > 0, looping continuously	4			
		Pause and rewind to In Frame	5			
		Scrub (Display) the selected In Frame	6			
		Scrub (Display) the selected Out Frame	7			
		Scrub (Display) the selected In Frame with statistics	8			
		Scrub (Display) the selected Out Frame with statistics	9			
		Reserved	10-255	3-100		

Chan #	Function	Description	Value dec.	Value %	Default dec.	Default %
104	**Play Speed**	Normal Speed	0	0	128	50
		Slow speeds from slowest toward normal	1-127	1-49		
		Normal Speed	128	50		
		Faster than Normal to Fastest	129-255	51-100		
Graphic 2 Synchronization						
105	**Sync Mode**	No selection	0	0	0	0
		Synch to Graphic 1 movie time	1	NA		
		Synch to Graphic 2 movie time	2			
		Synch to Graphic 3 movie time	3			
		Synch to Object rotation 1	4			
		Synch to Object rotation 2	5			
		Synch to Object rotation 3	6			
		Synch to reverse Object rotation 1	7			
		Synch to reverse Object rotation 2	8			
		Synch to reverse Object rotation 3	9			
		Synch to Graphic movie time and rotation 1	10			
		Synch to Graphic movie time and rotation 2	11			
		Synche to Graphic movie time and rotation 3	12			
		Synch to Graphic movie time + reverse rotation 1	13			
		Synch to Graphic movie time + reverse rotation 2	14			
		Synch to Graphic movie time + reverse rotation 3	15			
		Reserved. Defaults to mode 0, no selection.	16- 255			
106	**Sync To**	No Selection	0	NA	0	0
		Sync to Fixture ID Number 1	1			
		Sync to Fixture ID Number 2 . . .	2 . . .			
		Sync to Fixture Number 254	254			
		Sync to Fixture ID Number 255	255			
Graphic 2 Effects						
107	**Visual Mode**	Off. No visual mode processing applied to output.	0	NA	1	1
		Content Optimization Mod1=black level, Mod2=contrast.	1			
		Sepia tones. Mod1 fades from original color to sepia colors. Mod2 controls saturation.	2			
		Red tones. Mod1 fades from original color to red tones. Mod2 controls saturation.	3			
		Gray maker. Mod1 compresses colors to shades of gray. Mod2 adjusts contrast	4			
		Gray maker2. Always gray. Mod1 = brightness, Mod2 = contrast	5			

Chan #	Function	Description	Value dec.	Value %	Default dec.	Default %
107	**Visual Mode**	Posterizer. Mod1 reduces color detail. Mod2 adjusts contrast.	6	NA	1	1
		Color to Black & White. Mod1 fades color RGB @0 to B/W @50% to white @100%. Mod2= not used.	7			
		Fire Gradient, Mod1fades original to converted Mod2 not used, reserved.	8			
		Negative Art. Mod1 fades from original image to converted image, Mod2 subtracts red from 0-128, subtracts green from 129-255.	9			
		Exposure Control. Mod1 adjusts color contrast, Mod2 adjusts color shift	10			
		Invert B&W, Keep Color. Mod1 = black comparison level, Mod2= white comparison level	11			
		Texture Mixing. Mod1= Source media file, Mod2= Crossfade from original to source texture	12			
		Reserved, defaults to 0ff	13-255			
108	**Visual Mode Modifier 1**	Adjusts selected Visual Mode from 0 to maximum	0-255	0-100	0	0
109	**Visual Mode Modifier 2**	Adjusts selected Visual Mode from 0 to maximum	0-255	0-100	0	0
110	**Effect Mode 1**	Off, no effects selection	0	0	0	0
		CMY simulates CMY by subtracting RGB (reduces color values) Mod1 = cyan, Mod2 = magenta, Mod3 = yellow	1	NA	0	0
		CMY Add to All Pixels increases color values. Mod1 = cyan, Mod2 = magenta, Mod3 = yellow	2			
		CMY Add to Non-black Pixels increases color values. Mod1 = cyan, Mod2 = magenta, Mod3 = yellow	3			
		RGB Add All Pixels. Mod1 = red, Mod2 = green, Mod3 = blue	4			
		RGB Add 2 All Pixels. Mod1 = red, Mod2 = green, Mod3 = blue	5			
		RGB Add, non-black pixels. Mod1 = red, Mod2 = green, Mod3 = blue	6			
		RGB Swap to GBR Mod1 = red, Mod2 = green, Mod3 = blue.	7			
		RGB Swap to BGR Mod1 = red, Mod2 = green, Mod3 = blue.	8			
		Solarize 1 (if color value < DMX value, invert color) Mod1 = red, Mod2 = green, Mod3 = blue.	9			
		Solarize 2 (if color value > DMX, invert color) Mod1 = red, Mod2 = green, Mod3 = blue.	10			

Chan #	Function	Description	Value dec.	Value %	Default dec.	Default %
110	**Effect Mode 1**	Solarize (if color value < DMX, set color to 0) Mod1 = red, Mod2 = green, Mod3 = blue.	11	NA	0	0
		Solarize 4 (if color value > DMX, set color to 0) Mod1 = red, Mod2 = green, Mod3 = blue.	12			
		DotP and Resample Mod1, Mod2 and Mod3 control resampling.	13			
		Color Cycle (DMX value controls cycle speed) Mod1 = red, Mod2 = green, Mod3 = blue.	14			
		All or Nothing (Color value greater than Mod value, color = 255, else color = 0) Mod1 = red, Mod2 = green, Mod3 = blue.	15			
		Solid Color RGB Mod1 = red, Mod2 = green, Mod3 = blue.	16			
		RGB Invert Mod1 = red to inverted red, Mod2 = green to inverted green, Mod3 = blue to inverted blue	17			
		RGB Invert & Swap to GBR Mod1 = red to inverted green, Mod2 = green to inverted blue, Mod3 = blue to inverted red	18			
		RGB Invert & Swap to BRG Mod1 = red to inverted blue, Mod2 = green to inverted red, Mod3 = blue to inverted green	19			
		Edge Detect Color Mod1=horizontal size, Mod2 = vertical search size, Mod3=comparison threshold	20			
		Edge Detect B/W Mod1=horizontal size, Mod2 = vertical search size, Mod3=comparison threshold	21			
		Texture Ripple, Horizontal Mod1=size, Mod2=rate, Mod3=offset	22			
		Texture Ripple, Vertical Mod1=size, Mod2=rate, Mod3=offset	23			
		Texture Ripple, Circular Mod1=size, Mod2=rate, Mod3=offset	24			
		Texture Ripple, Asymmetrical Circular Mod1=size, Mod2=rate, Mod3=offset	25			
		Chromakey Fine. Select key color using Mod1=red, Mod2 =green, Mod3 =blue	26			
		Chromakey Medium. Select key color using Mod1 =red, Mod2 =green, Mod3 =blue	27			
		Chromakey Coarse. Select key color using Mod1 =red, Mod2 =green, Mod3 =blue	28			
		Chromakey Inverse, Fine. Select key color using Mod1 =red, Mod2 =green, Mod3 =blue	29			
		Chromakey Inverse, Medium. Select key color using Mod1 =red, Mod2 =green, Mod3 =blue	30			

Chan #	Function	Description	Value dec.	Value %	Default dec.	Default %
110	**Effect Mode 1**	Chromakey Inverse, Coarse. Select key color using Mod1 =red, Mod2 =green, Mod3 =blue	31	NA	0	0
		Scan Line: Mod1 selects scan line as texture, Mod2 fades from original image to converted image, Mod3 not used, reserved	32			
		Transparent Wipes: Mod1 =width of transparent area, Mod2 =center of transparent area, Mod3=transparency mode	33			
		Pixel Twist Mod1 = x twist center, Mod2 = y twist center, Mod3 =direction and amount of twist	34			
		Picture-in-Picture Mod1= x subpicture center, Mod2 = y subpicture center, Mod3= subpicture size	35			
		Magnifying Lens Mod1 =x lens center, Mod2 =y lens center, Mod3=lens size	36			
		Magnifying Lens 2 Mod1= x lens center, Mod2 = y lens center, Mod3 = lens size	37			
		Cartoon Edge Mod1 = Edge Color, Mod2= Contrast, Mod3= Edge detection sensitivity	38			
		Color DeConverge Mod1= Moves red up, Mod2 = Moves green down and right, Mod3 = Moves blue down and left	39			
		Horizontal Mirror, Mod1 = mirror center, Mod2 and Mod3 not used	40			
		RGB Swap to BGR Mod1 = red, Mod2 = green, Mod3 = blue	41			
		RGB Swap to RBG Mod1 = red, Mod2 = green, Mod3 = blue	42			
		RGB Swap to GRB Mod1 = red, Mod2 = green, Mod3 = blue	43			
		Colorize Gray Scale maps pixel intensity to color: Mod1 = Color Scheme selection, Mod2 = Zero intensity point in color scheme, Mod3 = Fading	44			
		Intensity key turns pixels of selected intensity transparent: Mod1= Color Scheme selection, Mod2 - Intensity bandwidth, Mod3 = Controls transparency	45			
		Raindrop effect. Mod1 controls size/speed, Mod2 seeds the random number generator, and Mod3 controls raindrop rate.	46			
		Scale RGB. Mod1= scale red, Mod2=scale green, Mod3=scale blue. Maximum of Mod1, Mod2 and Mod3 sets overall color range	47			

Chan #	Function	Description	Value dec.	Value %	Default dec.	Default %
110	**Effect Mode 1**	Tiling On (Scaler of 128=1 to 1) *Note: Tiling on Mode 1 overrides tiling on Effect Mode 2* Mod1=x-axis tiling scaler, Mod2=y-axis tiling scaler. Mod3 not used.	48	NA	0	0
		Color to Alpha. Mod1 = red to alpha, Mod2 = green to alpha, Mod3 = blue to alpha	49			
		Color to Alpha, Inverted. Mod1 = inverted red to alpha, Mod2 = inverted green to alpha, Mod3 = inverted blue to alpha	50			
		Texture Mixing. Mod1= Source media file, Mod2= Source effect level, Mod3= Crossfade from original to source texture	51			
		Reserved. Defaults to effect 0	52-63			
		Sinewave, Circular with Y-axis Wobbulation Mod1=size, Mod2=rate, Mod3=offset	64			
		Sinewave, Circular with Y-axis Wobbulation Mod1=size, Mod2=rate, Mod3=offset	65			
		Sinewave, Circular with Z-axis Wobbulation Mod1=size, Mod2=rate, Mod3=offset	66			
		Sinewave, Horizontal with X-axis Wobbulation Mod1=size, Mod2=rate, Mod3=offset	67			
		Sinewave, Horizontal with Y-axis Wobbulation Mod1=size, Mod2=rate, Mod3=offset	68			
		Sinewave, Horizontal with Z-axis Wobbulation Mod1=size, Mod2=rate, Mod3=offset	69			
		Sinewave, Vertical with X-axis Wobbulation Mod1=size, Mod2=rate, Mod3=offset	70			
		Sinewave, Vertical with Y-axis Wobbulation Mod1=size, Mod2=rate, Mod3=offset	71			
		Sinewave, Vertical with Z-axis Wobbulation Mod1=size, Mod2=rate, Mod3=offset	72			
		Glow: Mod1=red, Mod2= green, Mod3=blue	73			
		Glow Color Cycle: Mod1= red cycle speed, Mod2= green cycle speed, Mod3= Blue cycle speed	74			
		Reserved, defaults to Effect 0	75-255			
111	**Effect Mode 1 Modifier 1**	Adjusts effect selected in Effect Mode 1 from no adjustment at a DMX value of 0 to maximum adjustment at 255 (100%). The type of adjustment depends on the effect. *Note: for some effects, one or more modifiers may not be used.*	0-255	1-100	0	0
112	**Effect Mode 1 Modifier 2**		0-255	1-100	0	0
113	**Effect Mode 1 Modifier 3**		0-255	1-100	0	0

Chan #	Function	Description	Value dec.	Value %	Default dec.	Default %
114	**Effect Mode 2**	Off, no effects selection		NA	0	0
		CMY simulates CMY by subtracting RGB (reduces color values) Mod1 = cyan, Mod2 = magenta, Mod3 = yellow	1			
		CMY Add to All Pixels increases color values. Mod1 = cyan, Mod2 = magenta, Mod3 = yellow	2			
		CMY Add to Non-black Pixels increases color values. Mod1 = cyan, Mod2 = magenta, Mod3 = yellow	3			
		RGB Add All Pixels. Mod1 = red, Mod2 = green, Mod3 = blue	4			
		RGB Add 2 All Pixels. Mod1 = red, Mod2 = green, Mod3 = blue	5			
		RGB Add, non-black pixels. Mod1 = red, Mod2 = green, Mod3 = blue	6			
		RGB Swap to GBR Mod1 = red, Mod2 = green, Mod3 = blue.	7			
		RGB Swap to BGR Mod1 = red, Mod2 = green, Mod3 = blue.	8			
		Solarize 1 (if color value < DMX value, invert color) Mod1 = red, Mod2 = green, Mod3 = blue.	9			
		Solarize 2 (if color value > DMX, invert color) Mod1 = red, Mod2 = green, Mod3 = blue.	10			
		Solarize (if color value < DMX, set color to 0) Mod1 = red, Mod2 = green, Mod3 = blue.	11			
		Solarize 4 (if color value > DMX, set color to 0) Mod1 = red, Mod2 = green, Mod3 = blue.	12			
		DotP and Resample Mod1, Mod2 and Mod3 control resampling.	13			
		Color Cycle (DMX value controls cycle speed) Mod1 = red, Mod2 = green, Mod3 = blue.	14			
		All or Nothing (Color value greater than Mod value, color = 255, else color = 0) Mod1 = red, Mod2 = green, Mod3 = blue.	15			
		Solid Color RGB Mod1 = red, Mod2 = green, Mod3 = blue.	16			
		RGB Invert Mod1 = red to inverted red, Mod2 = green to inverted green, Mod3 = blue to inverted blue	17			
		RGB Invert & Swap to GBR Mod1 = red to inverted green, Mod2 = green to inverted blue, Mod3 = blue to inverted red	18			
		RGB Invert & Swap to BRG Mod1 = red to inverted blue, Mod2 = green to inverted red, Mod3 = blue to inverted green	19			

Chan #	Function	Description	Value dec.	Value %	Default dec.	Default %
114	**Effect Mode 2**	Edge Detect Color Mod1=horizontal size, Mod2 = vertical search size, Mod3=comparison threshold	20	NA	0	0
		Edge Detect B/W Mod1=horizontal size, Mod2 = vertical search size, Mod3=comparison threshold	21			
		Texture Ripple, Horizontal Mod1=size, Mod2=rate, Mod3=offset	22			
		Texture Ripple, Vertical Mod1=size, Mod2=rate, Mod3=offset	23			
		Texture Ripple, Circular Mod1=size, Mod2=rate, Mod3=offset	24			
		Texture Ripple, Asymmetrical Circular Mod1=size, Mod2=rate, Mod3=offset	25			
		Chromakey Fine. Select key color using Mod1=red, Mod2 =green, Mod3 =blue	26			
		Chromakey Medium. Select key color using Mod1 =red, Mod2 =green, Mod3 =blue	27			
		Chromakey Coarse. Select key color using Mod1 =red, Mod2 =green, Mod3 =blue	28			
		Chromakey Inverse, Fine. Select key color using Mod1 =red, Mod2 =green, Mod3 =blue	29			
		Chromakey Inverse, Medium. Select key color using Mod1 =red, Mod2 =green, Mod3 =blue	30			
		Chromakey Inverse, Coarse. Select key color using Mod1 =red, Mod2 =green, Mod3 =blue	31			
		Scan Line: Mod1 selects scan line as texture, Mod2 fades from original image to converted image, Mod3 not used, reserved	32			
		Transparent Wipes: Mod1 =width of transparent area, Mod2 =center of transparent area, Mod3=transparency mode	33			
		Pixel Twist Mod1 = x twist center, Mod2 = y twist center, Mod3 =direction and amount of twist	34			
		Picture-in-Picture Mod1= x subpicture center, Mod2 = y subpicture center, Mod3= subpicture size	35			
		Magnifying Lens Mod1 =x lens center, Mod2 =y lens center, Mod3=lens size	36			
		Magnifying Lens 2 Mod1= x lens center, Mod2 = y lens center, Mod3 = lens size	37			
		Cartoon Edge. Mod1 = Edge Color, Mod2= Contrast, Mod3= Edge detection sensitivity	38			

Chan #	Function	Description	Value dec.	Value %	Default dec.	Default %
114	**Effect Mode 2**	Color DeConverge Mod1= Moves red up, Mod2 = Moves green down and right, Mod3 = Moves blue down and left	39	NA	0	0
		RGB Swap to BGR Mod1 = red, Mod2 = green, Mod3 = blue	41			
		RGB Swap to RBG Mod1 = red, Mod2 = green, Mod3 = blue	42			
		RGB Swap to GRB Mod1 = red, Mod2 = green, Mod3 = blue	43			
		Colorize Gray Scale maps pixel intensity to color: Mod1 = Color Scheme selection, Mod2 = Zero intensity point in color scheme, Mod3 = Fading	44			
		Intensity key turns pixels of selected intensity transparent: Mod1= Color Scheme selection, Mod2 - Intensity bandwidth, Mod3 = Controls transparency	45			
		Raindrop effect. Mod1 controls size/speed, Mod2 seeds the random number generator, and Mod3 controls raindrop rate.	46			
		Scale RGB. Mod1= scale red, Mod2=scale green, Mod3=scale blue. Maximum of Mod1, Mod2 and Mod3 sets overall color range	47			
		Tiling On (Scaler of 128=1 to 1) *Note: Tiling on Mode 1 overrides tiling on Effect Mode 2* Mod1=x-axis tiling scaler, Mod2=y-axis tiling scaler. Mod3 not used.	48			
		Color to Alpha. Mod1 = red to alpha, Mod2 = green to alpha, Mod3 = blue to alpha	49			
		Color to Alpha, Inverted. Mod1 = inverted red to alpha, Mod2 = inverted green to alpha, Mod3 = inverted blue to alpha	50			
		Texture Mixing. Mod1= Source media file, Mod2= Source effect level, Mod3= Crossfade from original to source texture	51			
		Reserved. Defaults to effect 0	52-63			
		Sinewave, Circular with Y-axis Wobbulation Mod1=size, Mod2=rate, Mod3=offset	64			
		Sinewave, Circular with Y-axis Wobbulation Mod1=size, Mod2=rate, Mod3=offset	65			
		Sinewave, Circular with Z-axis Wobbulation Mod1=size, Mod2=rate, Mod3=offset	66			
		Sinewave, Horizontal with X-axis Wobbulation Mod1=size, Mod2=rate, Mod3=offset	67			
		Sinewave, Horizontal with Y-axis Wobbulation Mod1=size, Mod2=rate, Mod3=offset	68			

Chan #	Function	Description	Value dec.	Value %	Default dec.	Default %
114	**Effect Mode 2**	Sinewave, Horizontal with Z-axis Wobbulation Mod1=size, Mod2=rate, Mod3=offset	69	NA	0	0
		Sinewave, Vertical with X-axis Wobbulation Mod1=size, Mod2=rate, Mod3=offset	70			
		Sinewave, Vertical with Y-axis Wobbulation Mod1=size, Mod2=rate, Mod3=offset	71			
		Sinewave, Vertical with Z-axis Wobbulation Mod1=size, Mod2=rate, Mod3=offset	72			
		Glow: Mod1=red, Mod2= green, Mod3=blue	73			
		Glow Color Cycle: Mod1= red cycle speed, Mod2= green cycle speed, Mod3= Blue cycle speed	74			
		Reserved, defaults to Effect 0	75-255			
115	**Effect Mode 2 Modifier 1**	Adjusts effect selected in Effect Mode 1 from no adjustment at a DMX value of 0 to maximum adjustment at 255 (100%). The type of adjustment depends on the effect. *Note: for some effects, one or more modifiers may not be used.*	0-255	1-100	0	0
116	**Effect Mode 2 Modifier 2**		0-255	1-100	0	0
117	**Effect Mode 2 Modifier 3**		0-255	1-100	0	0
Graphic 2 Rotation						
118	**X-axis Rotation** *(vertical flip, 16-bit adjustment)*	Continuous variable-speed counterclockwise object rotation around X-axis (fast to slow)	0-16382	0-24	32768	50
		Continuous rotation stop	16383	25		
		Rotates the object counterclockwise around X-axis in steps to -720 degrees absolute	16384-32767	26-49		
		0° rotation around X-axis	32768	50		
119		Rotates the object clockwise around X-axis in steps to 720 degrees absolute	32769-49151	51-74		
		Continuous rotation stop	49152	75		
		Continuous variable-speed clockwise object rotation around X-axis (slow to fast)	49154-65535	76-100		
120	**Y-axis Rotation** *(horizontal flip, 16-bit adjustment)*	Continuous variable-speed counterclockwise object rotation around Y-axis (fast to slow)	0-16382	0-24	32768	50
		Continuous rotation stop	16383	25		
		Rotates the object counterclockwise around Y-axis in steps to -720 degrees absolute	16384-32767	26-49		
		0° rotation around Y-axis	32768	50		
121		Rotates the object clockwise around Y-axis in steps to 720 degrees absolute	32769-49151	51-74		
		Continuous rotation stop	49152	75		
		Continuous variable-speed clockwise object rotation around Y-axis (slow to fast)	49154-65535	76-100		

Chan #	Function	Description	Value dec.	Value %	Default dec.	Default %
122 123	**Z-axis Rotation** *(circular 16-bit adjustment)*	Continuous variable-speed counterclockwise object rotation around Z axis (fast to slow)	0-16382	0-24	32768	50
		Continuous rotation stop	16383	25		
		Rotates the object counterclockwise around Z-axis in steps to -720 degrees absolute	16384-32767	26-49		
		0° rotation around Z-axis	32768	50		
		Rotates the object clockwise around Z-axis in steps to 720 degrees absolute	32769-49151	51-74		
		Continuous rotation stop	49152	75		
		Continuous variable-speed clockwise object rotation around Z axis (slow to fast)	49154-65535	76-100		
Graphic 2 Scaling						
124	**Scale X**	Minimum object size along X axis (1:10)	0	0	128	50
		Increases object size along X axis from minimum to actual size	1-127	1-49		
		Actual size along X axis (1:1)	128	50		
		Increases object size along X axis from actual to maximum size	129-254	51-99		
		Maximum object size along X axis (10:1)	255	100		
125	**Scale Y**	Minimum object size along Y axis (1:10)	0	0	128	50
		Increases object size along Y axis from minimum to actual size	1-127	1-49		
		Actual size along Y axis (1:1)	128	50		
		Increases object size along Y axis from actual to maximum size	129-254	51-99		
		Maximum object size along Y axis (10:1)	255	100		
126	**Scale Z**	Minimum object size along Z axis (1:10)	0	0	128	50
		Increases object size along Z axis from minimum to actual size	1-127	1-49		
		Actual size along Z axis (1:1)	128	50		
		Increases object size along Z axis from actual to maximum size	129-254	51-99		
		Maximum object size along Z axis (10:1)	255	100		

Chan #	Function	Description	Value dec.	Value %	Default dec.	Default %
Graphic 2 Position						
127 128	**X-Position**	Moves object left from center of display	0-36767	0-49	32768	50
		Centers object along X axis in display	32768	50		
		Moves object right from center of display	36769-65535	51-100		
129 130	**Y-Position**	Moves object down from center of display	0-36767	0-49	32768	50
		Centers object along Y axis in display	32768	50		
		Moves object up from center of display	36769-65535	51-100		
131 132	**Z-Position**	Moves object nearer from center of display	0-36767	0-49	32768	50
		Centers object along Z axis in display	32768	50		
		Moves object back along Z axis at center of display	36769-65535	51-100		

Chan #	Function	Description	Value dec.	Value %	Default dec.	Default %
Graphic 3 Function (Standard Protocol)						
133	**Opacity**	Selects transparency level from completely transparent (0) to opaque (255)	0-255	0-100	0	0
Graphic 3 Content Definition						
134	**3-D Object File**	No selection	0	0	1	1
		First Stock 3-D Object (flat plane)	1	1		
		Additional Stock 3-D Objects	2-149	NA		
		First User 3-D Objects	150			
		Additional User Objects	151-255			
135	**Media Folder**	No selection	0	NA	0	0
		HES Folder 1	1			
		HES folder 2- 40	2-40			
		First User folder 41	41			
		User Folders 42-239	42-239			
		Reserved	240-254			
		Integrated video camera capture. The Media File parameter is ignored	255			
136	**Media File**	No selection	0	0	0	0
		First Media File	1	NA		
		Additional Media Files 2-255	2-255			
137 138	**In Frame**	Defines the beginning of a Media File segment as a percentage of the movie length	0-65535	0-100	0	0
139 140	**Out Frame**	Defines the end of a Media File segment as a percentage of the movie length	0-65535	0-100	65535	100
141	**Play Mode**	Play forward looping continuously	0	0	0	0
		Play forward once and hold on the last frame	1	NA		
		Pause	2			
		Play forward if opacity > 0, hold on last frame	3			
		Play forward if opacity > 0, looping continuously	4			
		Pause and rewind to In Frame	5			
		Scrub (Display) the selected In Frame	6			
		Scrub (Display) the selected Out Frame	7			
		Scrub (Display) the selected In Frame with statistics	8			
		Scrub (Display) the selected Out Frame with statistics	9			
		Reserved	10-255			

Chan #	Function	Description	Value dec.	Value %	Default dec.	Default %
142	**Play Speed**	Normal Speed	0	0	128	50
		Slow speeds from slowest toward normal	1-127	1-49		
		Normal Speed	128	50		
		Faster than Normal to Fastest	129-255	51-100		
Graphic 3 Synchronization						
143	**Sync Mode**	No selection	0	0	0	0
		Synch to Graphic 1 movie time	1	NA		
		Synch to Graphic 2 movie time	2			
		Synch to Graphic 3 movie time	3			
		Synch to Object rotation 1	4			
		Synch to Object rotation 2	5			
		Synch to Object rotation 3	6			
		Synch to reverse Object rotation 1	7			
		Synch to reverse Object rotation 2	8			
		Synch to reverse Object rotation 3	9			
		Synch to Graphic movie time and rotation 1	10			
		Synch to Graphic movie time and rotation 2	11			
		Synche to Graphic movie time and rotation 3	12			
		Synch to Graphic movie time + reverse rotation 1	13			
		Synch to Graphic movie time + reverse rotation 2	14			
		Synch to Graphic movie time + reverse rotation 3	15			
		Reserved. Defaults to mode 0, no selection.	16- 255			
144	**Sync To**	No Selection	0	NA	0	0
		Sync to Fixture ID Number 1	1			
		Sync to Fixture ID Number 2 . . . Sync to Fixture Number 254	2 . . . 254			
		Sync to Fixture ID Number 255	255			
Graphic 3 Effects						
145	**Visual Mode**	Off. No visual mode processing applied to output.	0	NA	1	1
		Content Optimization Mod1=black level, Mod2=contrast.	1			
		Sepia tones. Mod1 fades from original color to sepia colors. Mod2 controls saturation.	2			
		Red tones. Mod1 fades from original color to red tones. Mod2 controls saturation.	3			
		Gray maker. Mod1 compresses colors to shades of gray. Mod2 adjusts contrast	4			

Chan #	Function	Description	Value dec.	Value %	Default dec.	Default %
145	**Visual Mode**	Gray maker2. Always gray. Mod1 = brightness, Mod2 = contrast	5	NA	1	1
		Posterizer. Mod1 reduces color detail. Mod2 adjusts contrast.	6			
		Color to Black & White. Mod1 fades color RGB @0 to B/W @50% to white @100%. Mod2= not used.	7			
		Fire Gradient, Mod1fades original to converted Mod2 not used, reserved.	8			
		Negative Art. Mod1 fades from original image to converted image, Mod2 subtracts red from 0-128, subtracts green from 129-255.	9			
		Exposure Control. Mod1 adjusts color contrast, Mod2 adjusts color shift	10			
		Invert B&W, Keep Color. Mod1 = black comparison level, Mod2= white comparison level	11			
		Texture Mixing. Mod1= Source media file, Mod2= Crossfade from original to source texture	12			
		Reserved, defaults to 0ff	13-255			
146	**Visual Mode Modifier 1**	Adjusts selected Visual Mode from 0 to maximum	0-255	0-100	0	0
147	**Visual Mode Modifier 2**	Adjusts selected Visual Mode from 0 to maximum	0-255	0-100	0	0
148	**Effect Mode 1**	Off, no effects selection	0	0	0	0
		CMY simulates CMY by subtracting RGB (reduces color values) Mod1 = cyan, Mod2 = magenta, Mod3 = yellow	1	NA		
		CMY Add to All Pixels increases color values. Mod1 = cyan, Mod2 = magenta, Mod3 = yellow	2			
		CMY Add to Non-black Pixels increases color values. Mod1 = cyan, Mod2 = magenta, Mod3 = yellow	3			
		RGB Add All Pixels. Mod1 = red, Mod2 = green, Mod3 = blue	4			
		RGB Add 2 All Pixels. Mod1 = red, Mod2 = green, Mod3 = blue	5			
		RGB Add, non-black pixels. Mod1 = red, Mod2 = green, Mod3 = blue	6			
		RGB Swap to GBR Mod1 = red, Mod2 = green, Mod3 = blue.	7			
		RGB Swap to BGR Mod1 = red, Mod2 = green, Mod3 = blue.	8			
		Solarize 1 (if color value < DMX value, invert color) Mod1 = red, Mod2 = green, Mod3 = blue.	9			

Chan #	Function	Description	Value dec.	Value %	Default dec.	Default %
148	**Effect Mode 1**	Solarize 2 (if color value > DMX, invert color) Mod1 = red, Mod2 = green, Mod3 = blue.	10	NA	0	0
		Solarize (if color value < DMX, set color to 0) Mod1 = red, Mod2 = green, Mod3 = blue.	11			
		Solarize 4 (if color value > DMX, set color to 0) Mod1 = red, Mod2 = green, Mod3 = blue.	12			
		DotP and Resample Mod1, Mod2 and Mod3 control resampling.	13			
		Color Cycle (DMX value controls cycle speed) Mod1 = red, Mod2 = green, Mod3 = blue.	14			
		All or Nothing (Color value greater than Mod value, color = 255, else color = 0) Mod1 = red, Mod2 = green, Mod3 = blue.	15			
		Solid Color RGB Mod1 = red, Mod2 = green, Mod3 = blue.	16			
		RGB Invert Mod1 = red to inverted red, Mod2 = green to inverted green, Mod3 = blue to inverted blue	17			
		RGB Invert & Swap to GBR Mod1 = red to inverted green, Mod2 = green to inverted blue, Mod3 = blue to inverted red	18			
		RGB Invert & Swap to BRG Mod1 = red to inverted blue, Mod2 = green to inverted red, Mod3 = blue to inverted green	19			
		Edge Detect Color Mod1=horizontal size, Mod2 = vertical search size, Mod3=comparison threshold	20			
		Edge Detect B/W Mod1=horizontal size, Mod2 = vertical search size, Mod3=comparison threshold	21			
		Texture Ripple, Horizontal Mod1=size, Mod2=rate, Mod3=offset	22			
		Texture Ripple, Vertical Mod1=size, Mod2=rate, Mod3=offset	23			
		Texture Ripple, Circular Mod1=size, Mod2=rate, Mod3=offset	24			
		Texture Ripple, Asymmetrical Circular Mod1=size, Mod2=rate, Mod3=offset	25			
		Chromakey Fine. Select key color using Mod1=red, Mod2 =green, Mod3 =blue	26			
		Chromakey Medium. Select key color using Mod1 =red, Mod2 =green, Mod3 =blue	27			
		Chromakey Coarse. Select key color using Mod1 =red, Mod2 =green, Mod3 =blue	28			
		Chromakey Inverse, Fine. Select key color using Mod1 =red, Mod2 =green, Mod3 =blue	29			

Chan #	Function	Description	Value dec.	Value %	Default dec.	Default %
148	**Effect Mode 1**	Chromakey Inverse, Medium. Select key color using Mod1 =red, Mod2 =green, Mod3 =blue	30	NA	0	0
		Chromakey Inverse, Coarse. Select key color using Mod1 =red, Mod2 =green, Mod3 =blue	31			
		Scan Line: Mod1 selects scan line as texture, Mod2 fades from original image to converted image, Mod3 not used, reserved	32			
		Transparent Wipes: Mod1 =width of transparent area, Mod2 =center of transparent area, Mod3=transparency mode	33			
		Pixel Twist Mod1 = x twist center, Mod2 = y twist center, Mod3 =direction and amount of twist	34			
		Picture-in-Picture Mod1= x subpicture center, Mod2 = y subpicture center, Mod3= subpicture size	35			
		Magnifying Lens Mod1 =x lens center, Mod2 =y lens center, Mod3=lens size	36			
		Magnifying Lens 2 Mod1= x lens center, Mod2 = y lens center, Mod3 = lens size	37			
		Cartoon Edge Mod1 = Edge Color, Mod2= Contrast, Mod3= Edge detection sensitivity	38			
		Color DeConverge Mod1= Moves red up, Mod2 = Moves green down and right, Mod3 = Moves blue down and left	39			
		Horizontal Mirror, Mod1 = mirror center, Mod2 and Mod3 not used	40			
		RGB Swap to BGR Mod1 = red, Mod2 = green, Mod3 = blue	41			
		RGB Swap to RBG Mod1 = red, Mod2 = green, Mod3 = blue	42			
		RGB Swap to GRB Mod1 = red, Mod2 = green, Mod3 = blue	43			
		Colorize Gray Scale maps pixel intensity to color: Mod1 = Color Scheme selection, Mod2 = Zero intensity point in color scheme, Mod3 = Fading	44			
		Intensity key turns pixels of selected intensity transparent: Mod1= Color Scheme selection, Mod2 - Intensity bandwidth, Mod3 = Controls transparency	45			
		Raindrop effect. Mod1 controls size/speed, Mod2 seeds the random number generator, and Mod3 controls raindrop rate.	46			

Chan #	Function	Description	Value dec.	Value %	Default dec.	Default %
148	**Effect Mode 1**	Scale RGB. Mod1= scale red, Mod2=scale green, Mod3=scale blue. Maximum of Mod1, Mod2 and Mod3 sets overall color range	47	NA	0	0
		Tiling On (Scaler of 128=1 to 1) *Note: Tiling on Mode 1 overrides tiling on Effect Mode 2* Mod1=x-axis tiling scaler, Mod2=y-axis tiling scaler. Mod3 not used.	48			
		Color to Alpha. Mod1 = red to alpha, Mod2 = green to alpha, Mod3 = blue to alpha	49			
		Color to Alpha, Inverted. Mod1 = inverted red to alpha, Mod2 = inverted green to alpha, Mod3 = inverted blue to alpha	50			
		Texture Mixing. Mod1= Source media file, Mod2= Source effect level, Mod3= Crossfade from original to source texture	51			
		Reserved. Defaults to effect 0	52-63			
		Sinewave, Circular with Y-axis Wobbulation Mod1=size, Mod2=rate, Mod3=offset	64			
		Sinewave, Circular with Y-axis Wobbulation Mod1=size, Mod2=rate, Mod3=offset	65			
		Sinewave, Circular with Z-axis Wobbulation Mod1=size, Mod2=rate, Mod3=offset	66			
		Sinewave, Horizontal with X-axis Wobbulation Mod1=size, Mod2=rate, Mod3=offset	67			
		Sinewave, Horizontal with Y-axis Wobbulation Mod1=size, Mod2=rate, Mod3=offset	68			
		Sinewave, Horizontal with Z-axis Wobbulation Mod1=size, Mod2=rate, Mod3=offset	69			
		Sinewave, Vertical with X-axis Wobbulation Mod1=size, Mod2=rate, Mod3=offset	70			
		Sinewave, Vertical with Y-axis Wobbulation Mod1=size, Mod2=rate, Mod3=offset	71			
		Sinewave, Vertical with Z-axis Wobbulation Mod1=size, Mod2=rate, Mod3=offset	72			
		Glow: Mod1=red, Mod2= green, Mod3=blue	73			
		Glow Color Cycle: Mod1= red cycle speed, Mod2= green cycle speed, Mod3= Blue cycle speed	74			
		Reserved, defaults to Effect 0	75-255			
149	**Effect Mode 1 Modifier 1**	Adjusts effect selected in Effect Mode 1 from no adjustment at a DMX value of 0 to maximum adjustment at 255 (100%). The type of adjustment depends on the effect. *Note: for some effects, one or more modifiers may not be used.*	0-255	1-100	0	0
150	**Effect Mode 1 Modifier 2**		0-255	1-100	0	0
151	**Effect Mode 1 Modifier 3**		0-255	1-100	0	0

Chan #	Function	Description	Value dec.	Value %	Default dec.	Default %
152	**Effect Mode 2**	Off, no effects selection		NA	0	0
		CMY simulates CMY by subtracting RGB (reduces color values) Mod1 = cyan, Mod2 = magenta, Mod3 = yellow	1			
		CMY Add to All Pixels increases color values. Mod1 = cyan, Mod2 = magenta, Mod3 = yellow	2			
		CMY Add to Non-black Pixels increases color values. Mod1 = cyan, Mod2 = magenta, Mod3 = yellow	3			
		RGB Add All Pixels. Mod1 = red, Mod2 = green, Mod3 = blue	4			
		RGB Add 2 All Pixels. Mod1 = red, Mod2 = green, Mod3 = blue	5			
		RGB Add, non-black pixels. Mod1 = red, Mod2 = green, Mod3 = blue	6			
		RGB Swap to GBR Mod1 = red, Mod2 = green, Mod3 = blue.	7			
		RGB Swap to BGR Mod1 = red, Mod2 = green, Mod3 = blue.	8			
		Solarize 1 (if color value < DMX value, invert color) Mod1 = red, Mod2 = green, Mod3 = blue.	9			
		Solarize 2 (if color value > DMX, invert color) Mod1 = red, Mod2 = green, Mod3 = blue.	10			
		Solarize (if color value < DMX, set color to 0) Mod1 = red, Mod2 = green, Mod3 = blue.	11			
		Solarize 4 (if color value > DMX, set color to 0) Mod1 = red, Mod2 = green, Mod3 = blue.	12			
		DotP and Resample Mod1, Mod2 and Mod3 control resampling.	13			
		Color Cycle (DMX value controls cycle speed) Mod1 = red, Mod2 = green, Mod3 = blue.	14			
		All or Nothing (Color value greater than Mod value, color = 255, else color = 0) Mod1 = red, Mod2 = green, Mod3 = blue.	15			
		Solid Color RGB Mod1 = red, Mod2 = green, Mod3 = blue.	16			
		RGB Invert Mod1 = red to inverted red, Mod2 = green to inverted green, Mod3 = blue to inverted blue	17			
		RGB Invert & Swap to GBR Mod1 = red to inverted green, Mod2 = green to inverted blue, Mod3 = blue to inverted red	18			
		RGB Invert & Swap to BRG Mod1 = red to inverted blue, Mod2 = green to inverted red, Mod3 = blue to inverted green	19			

Chan #	Function	Description	Value dec.	Value %	Default dec.	Default %
152	**Effect Mode 2**	Edge Detect Color Mod1=horizontal size, Mod2 = vertical search size, Mod3=comparison threshold	20	NA	0	0
		Edge Detect B/W Mod1=horizontal size, Mod2 = vertical search size, Mod3=comparison threshold	21			
		Texture Ripple, Horizontal Mod1=size, Mod2=rate, Mod3=offset	22			
		Texture Ripple, Vertical Mod1=size, Mod2=rate, Mod3=offset	23			
		Texture Ripple, Circular Mod1=size, Mod2=rate, Mod3=offset	24			
		Texture Ripple, Asymmetrical Circular Mod1=size, Mod2=rate, Mod3=offset	25			
		Chromakey Fine. Select key color using Mod1=red, Mod2 =green, Mod3 =blue	26			
		Chromakey Medium. Select key color using Mod1 =red, Mod2 =green, Mod3 =blue	27			
		Chromakey Coarse. Select key color using Mod1 =red, Mod2 =green, Mod3 =blue	28			
		Chromakey Inverse, Fine. Select key color using Mod1 =red, Mod2 =green, Mod3 =blue	29			
		Chromakey Inverse, Medium. Select key color using Mod1 =red, Mod2 =green, Mod3 =blue	30			
		Chromakey Inverse, Coarse. Select key color using Mod1 =red, Mod2 =green, Mod3 =blue	31			
		Scan Line: Mod1 selects scan line as texture, Mod2 fades from original image to converted image, Mod3 not used, reserved	32			
		Transparent Wipes: Mod1 =width of transparent area, Mod2 =center of transparent area, Mod3=transparency mode	33			
		Pixel Twist Mod1 = x twist center, Mod2 = y twist center, Mod3 =direction and amount of twist	34			
		Picture-in-Picture Mod1= x subpicture center, Mod2 = y subpicture center, Mod3= subpicture size	35			
		Magnifying Lens Mod1 =x lens center, Mod2 =y lens center, Mod3=lens size	36			
		Magnifying Lens 2 Mod1= x lens center, Mod2 = y lens center, Mod3 = lens size	37			
		Cartoon Edge. Mod1 = Edge Color, Mod2= Contrast, Mod3= Edge detection sensitivity	38			

Chan #	Function	Description	Value dec.	Value %	Default dec.	Default %
152	**Effect Mode 2**	Color DeConverge Mod1= Moves red up, Mod2 = Moves green down and right, Mod3 = Moves blue down and left	39	NA	0	0
		RGB Swap to BGR Mod1 = red, Mod2 = green, Mod3 = blue	41			
		RGB Swap to RBG Mod1 = red, Mod2 = green, Mod3 = blue	42			
		RGB Swap to GRB Mod1 = red, Mod2 = green, Mod3 = blue	43			
		Colorize Gray Scale maps pixel intensity to color: Mod1 = Color Scheme selection, Mod2 = Zero intensity point in color scheme, Mod3 = Fading	44			
		Intensity key turns pixels of selected intensity transparent: Mod1= Color Scheme selection, Mod2 - Intensity bandwidth, Mod3 = Controls transparency	45			
		Raindrop effect. Mod1 controls size/speed, Mod2 seeds the random number generator, and Mod3 controls raindrop rate.	46			
		Scale RGB. Mod1= scale red, Mod2=scale green, Mod3=scale blue. Maximum of Mod1, Mod2 and Mod3 sets overall color range	47			
		Tiling On (Scaler of 128=1 to 1) *Note: Tiling on Mode 1 overrides tiling on Effect Mode 2* Mod1=x-axis tiling scaler, Mod2=y-axis tiling scaler. Mod3 not used.	48			
		Color to Alpha. Mod1 = red to alpha, Mod2 = green to alpha, Mod3 = blue to alpha	49			
		Color to Alpha, Inverted. Mod1 = inverted red to alpha, Mod2 = inverted green to alpha, Mod3 = inverted blue to alpha	50			
		Texture Mixing. Mod1= Source media file, Mod2= Source effect level, Mod3= Crossfade from original to source texture	51			
		Reserved. Defaults to effect 0	52-63			
		Sinewave, Circular with Y-axis Wobbulation Mod1=size, Mod2=rate, Mod3=offset	64			
		Sinewave, Circular with Y-axis Wobbulation Mod1=size, Mod2=rate, Mod3=offset	65			
		Sinewave, Circular with Z-axis Wobbulation Mod1=size, Mod2=rate, Mod3=offset	66			
		Sinewave, Horizontal with X-axis Wobbulation Mod1=size, Mod2=rate, Mod3=offset	67			
		Sinewave, Horizontal with Y-axis Wobbulation Mod1=size, Mod2=rate, Mod3=offset	68			

Chan #	Function	Description	Value dec.	Value %	Default dec.	Default %
152	**Effect Mode 2**	Sinewave, Horizontal with Z-axis Wobbulation Mod1=size, Mod2=rate, Mod3=offset	69	NA	0	0
		Sinewave, Vertical with X-axis Wobbulation Mod1=size, Mod2=rate, Mod3=offset	70			
		Sinewave, Vertical with Y-axis Wobbulation Mod1=size, Mod2=rate, Mod3=offset	71			
		Sinewave, Vertical with Z-axis Wobbulation Mod1=size, Mod2=rate, Mod3=offset	72			
		Glow: Mod1=red, Mod2= green, Mod3=blue	73			
		Glow Color Cycle: Mod1= red cycle speed, Mod2= green cycle speed, Mod3= Blue cycle speed	74			
		Reserved, defaults to Effect 0	75-255			
153	**Effect Mode 2 Modifier 1**	Adjusts effect selected in Effect Mode 1 from no adjustment at a DMX value of 0 to maximum adjustment at 255 (100%). The type of adjustment depends on the effect. *Note: for some effects, one or more modifiers may not be used.*	0-255	1-100	0	0
154	**Effect Mode 2 Modifier 2**		0-255	1-100	0	0
155	**Effect Mode 2 Modifier 3**		0-255	1-100	0	0
Graphic 3 Rotation						
156 157	**X-axis Rotation** *(vertical flip, 16-bit adjustment)*	Continuous variable-speed counterclockwise object rotation around X-axis (fast to slow)	0-16382	0-24	32768	50
		Continuous rotation stop	16383	25		
		Rotates the object counterclockwise around X-axis in steps to -720 degrees absolute	16384-32767	26-49		
		0° rotation around X-axis	32768	50		
		Rotates the object clockwise around X-axis in steps to 720 degrees absolute	32769-49151	51-74		
		Continuous rotation stop	49152	75		
		Continuous variable-speed clockwise object rotation around X-axis (slow to fast)	49154-65535	76-100		
158 159	**Y-axis Rotation** *(horizontal flip, 16-bit adjustment)*	Continuous variable-speed counterclockwise object rotation around Y-axis (fast to slow)	0-16382	0-24	32768	50
		Continuous rotation stop	16383	25		
		Rotates the object counterclockwise around Y-axis in steps to -720 degrees absolute	16384-32767	26-49		
		0° rotation around Y-axis	32768	50		
		Rotates the object clockwise around Y-axis in steps to 720 degrees absolute	32769-49151	51-74		
		Continuous rotation stop	49152	75		
		Continuous variable-speed clockwise object rotation around Y-axis (slow to fast)	49154-65535	76-100		

Chan #	Function	Description	Value dec.	Value %	Default dec.	Default %
160 161	**Z-axis Rotation** *(circular 16-bit adjustment)*	Continuous variable-speed counterclockwise object rotation around Z axis (fast to slow)	0-16382	0-24	32768	50
		Continuous rotation stop	16383	25		
		Rotates the object counterclockwise around Z-axis in steps to -720 degrees absolute	16384-32767	26-49		
		0° rotation around Z-axis	32768	50		
		Rotates the object clockwise around Z-axis in steps to 720 degrees absolute	32769-49151	51-74		
		Continuous rotation stop	49152	75		
		Continuous variable-speed clockwise object rotation around Z axis (slow to fast)	49154-65535	76-100		
Graphic 3 Scaling						
162	**Scale X**	Minimum object size along X axis (1:10)	0	0	128	50
		Increases object size along X axis from minimum to actual size	1-127	1-49		
		Actual size along X axis (1:1)	128	50		
		Increases object size along X axis from actual to maximum size	129-254	51-99		
		Maximum object size along X axis (10:1)	255	100		
163	**Scale Y**	Minimum object size along Y axis (1:10)	0	0	128	50
		Increases object size along Y axis from minimum to actual size	1-127	1-49		
		Actual size along Y axis (1:1)	128	50		
		Increases object size along Y axis from actual to maximum size	129-254	51-99		
		Maximum object size along Y axis (10:1)	255	100		
164	**Scale Z**	Minimum object size along Z axis (1:10)	0	0	128	50
		Increases object size along Z axis from minimum to actual size	1-127	1-49		
		Actual size along Z axis (1:1)	128	50		
		Increases object size along Z axis from actual to maximum size	129-254	51-99		
		Maximum object size along Z axis (10:1)	255	100		

Chan #	Function	Description	Value dec.	Value %	Default dec.	Default %
Graphic 3 Position						
165 166	**X-Position**	Moves object left from center of display	0-36767	0-49	32768	50
		Centers object along X axis in display	32768	50		
		Moves object right from center of display	36769-65535	51-100		
167 168	**Y-Position**	Moves object down from center of display	0-36767	0-49	32768	50
		Centers object along Y axis in display	32768	50		
		Moves object up from center of display	36769-65535	51-100		
169 170	**Z-Position**	Moves object nearer from center of display	0-36767	0-49	32768	50
		Centers object along Z axis in display	32768	50		
		Moves object back along Z axis at center of display	36769-65535	51-100		

Appendix B:

MSpeed Conversion Table

This table lists the MSpeed (motor) movement times and their corresponding DMX controller values.

If you have a numeric-type DMX controller, use the Value Decimal (dec.) column. If you have a fader-type DMX controller, use the Value Percentage (%) column. If your DMX controller allows you to program hex values, use the Value (hex) column.

Time (sec.)	Value (dec.)	Value (%)	Value (hex)	Time (sec.)	Value (dec.)	Value (%)	Value (hex)	Time (sec.)	Value (dec.)	Value (%)	Value (hex)
0.15	255	100	FF	5.64	218	85	DA	22.10	181	71	B5
0.15	254	100	FE	5.94	217	85	D9	22.70	180	71	B4
0.17	253	99	FD	6.25	216	85	D8	23.30	179	70	B3
0.19	252	99	FC	6.56	215	84	D7	23.92	178	70	B2
0.21	251	98	FB	6.89	214	84	D6	24.54	177	69	B1
0.25	250	98	FA	7.22	213	84	D5	25.17	176	69	B0
0.29	249	98	F9	7.56	212	83	D4	25.80	175	69	AF
0.35	248	97	F8	7.91	211	83	D3	26.45	174	68	AE
0.41	247	97	F7	8.27	210	82	D2	27.10	173	68	AD
0.47	246	96	F6	8.63	209	82	D1	27.76	172	67	AC
0.55	245	96	F5	9.00	208	82	D0	28.43	171	67	AB
0.63	244	96	F4	9.39	207	81	CF	29.11	170	67	AA
0.73	243	95	F3	9.77	206	81	CE	29.80	169	66	A9
0.83	242	95	F2	10.17	205	80	CD	30.49	168	66	A8
0.94	241	95	F1	10.58	204	80	CC	31.19	167	65	A7
1.05	240	94	F0	10.99	203	80	CB	31.90	166	65	A6
1.18	239	94	EF	11.41	202	79	CA	32.62	165	65	A5
1.31	238	93	EE	11.84	201	79	C9	33.34	164	64	A4
1.45	237	93	ED	12.28	200	78	C8	34.08	163	64	A3
1.60	236	93	EC	12.72	199	78	C7	34.82	162	64	A2
1.75	235	92	EB	13.17	198	78	C6	35.57	161	63	A1
1.92	234	92	EA	13.63	197	77	C5	36.33	160	63	A0
2.09	233	91	E9	14.10	196	77	C4	37.09	159	62	9F
2.27	232	91	E8	14.58	195	76	C3	37.87	158	62	9E
2.46	231	91	E7	15.07	194	76	C2	38.65	157	62	9D
2.66	230	90	E6	15.56	193	76	C1	39.44	156	61	9C
2.86	229	90	E5	16.06	192	75	C0	39.44v	156	61	9C
3.07	228	89	E4	16.57	191	75	BF	40.23	155	61	9B
3.29	227	89	E3	17.09	190	75	BE	41.04	154	60	9A
3.52	226	89	E2	17.61	189	74	BD	41.85	153	60	99
3.76	225	88	E1	18.14	188	74	BC	42.68	152	60	98
4.00	224	88	E0	18.68	187	73	BB	43.50	151	59	97
4.25	223	87	DF	19.23	186	73	BA	44.34	150	59	96
4.52	222	87	DE	19.79	185	73	B9	45.19	149	58	95
4.78	221	87	DD	20.36	184	72	B8	46.04	148	58	94
5.06	220	86	DC	20.93	183	72	B7	46.90	147	58	93
5.34	219	86	DB	21.51	182	71	B6	47.77	146	57	92

Time (sec.)	Value (dec.)	Value (%)	Value (hex)
48.65	145	57	91
49.54	144	56	90
50.43	143	56	8F
51.33	142	56	8E
52.24	141	55	8D
53.16	140	55	8C
54.09	139	55	8h
55.02	138	54	8A
55.96v	137	54	89
56.91	136	53	88
57.87	135	53	87
58.84	134	53	86
59.81	133	52	85
60.79	132	52	84
61.78	131	51	83
62.78	130	51	82
63.79	129	51	81
64.80	128	50	80
65.82	127	50	7F
66.85	126	49	7E
67.89	125	49	7D
68.94	124	49	7C
69.99	123	48	7B
71.05	122	48	7A
72.13	121	47	79
73.20	120	47	78
74.29	119	47	77
75.38	118	46	76
76.49	117	46	75
77.60	116	45	74
78.71	115	45	73
79.84	114	45	72
80.98	113	44	71
82.12	112	44	70
83.27	111	44	6F
84.43	110	43	6E
85.59	109	43	6D
86.77	108	42	6C
87.95	107	42	6B
89.14	106	42	6A
90.34	105	41	69
91.55	104	41	68
92.76	103	40	67
93.98	102	40	66
95.21	101	40	65
96.45	100	39	64
97.70	99	39	63
98.95	98	38	62

Time (sec.)	Value (dec.)	Value (%)	Value (hex)
100.22	97	38	61
101.49	96	38	60
102.77	95	37	5F
104.05	94	37	5E
105.35	93	36	5D
106.65	92	36	5C
107.96	91	36	5B
109.28	90	35	5A
110.61	89	35	59
111.94	88	35	58
113.28	87	34	57
114.63	86	34	56
115.99	85	33	55
117.36	84	33	54
118.73	83	33	53
120.12	82	32	52
121.5v	81	32	51
122.91	80	31	50
124.31	79	31	4F
125.73	78	31	4E
127.15	77	30	4D
128.58	76	30	4C
130.02	75	29	4B
134.39	72	28	48
135.86	71	28	47
137.34	70	27	46
138.82	69	27	45
140.32	68	27	44
141.82	67	26	43
143.33	66	26	42
144.85	65	25	41
146.38	64	25	40
147.92	63	25	3F
149.46	62	24	3E
151.01	61	24	3D
152.57	60	24	3C
154.14	59	23	3B
155.71	58	23	3A
157.30	57	22	39
158.89	56	22	38
160.49	55	22	37
162.09	54	21	36
163.71	53	21	35
165.33	52	20	34
166.96	51	20	33
168.60	50	20	32
170.25	49	19	31
171.91	48	19	30

Time (sec.)	Value (dec.)	Value (%)	Value (hex)
173.57	47	18	2F
175.24	46	18	2E
176.92	45	18	2D
178.61	44	17	2C
180.30	43	17	2B
182.01	42	16	2A
183.72	41	16	29
185.44	40	16	28
187.17	39	15	27
188.90	38	15	26
190.65	37	15	25
192.40	36	14	24
194.16	35	14	23
195.92	34	13	22
197.70	33	13	21
199.48	32	13	20
201.28	31	12	1F
203.08	30	12	1E
204.88	29	11	1D
206.70	28	11	1C
208.52	27	11	1B
210.36	26	10	1A
212.19	25	10	19
214.04	24	9	18
215.90	23	9	17
217.76	22	9	16
219.63	21	8	15
221.51	20	8	14
223.40	19	7	13
225.30	18	7	12
227.20	17	7	11
229.11	16	6	10
231.03	15	6	0F
232.96	14	5	0E
234.90	13	5	0D
236.84	12	5	0C
238.79	11	4	0B
240.75	10	4	0A
242.72	9	4	09
244.70	8	3	08
246.68	7	3	07
248.68	6	2	06
250.68	5	2	05
246.68	7	3	07
248.68	6	2	06
250.68	5	2	05
252.68	4	2	04

Appendix C:

Custom User Content

There are several considerations to keep in mind when creating custom content to control with the DL.2 graphics engine software.

Read the following specifications and recommendations before creating custom content. If a file is not DL2 compatible, it may load but not appear as output. The CMA thumbnail view of content will note incompatible files with an X.

Creating Video Media Files

Cleaner on Mac and **Expert HD** or **TMPGEncoder** on PC for encoding solutions offer good quality and the most reliable DL.2 playback.

Any encoder you use will need to provide options that achieve the following specifications:

- Size to 640x480 pixels
- All I-frames (an I frame every 1 frame) for optimal tracking
- Constant Bit Rate (CBR) data rates of 10 to 12 megabits/sec
- Closed Group of Picture (GOP)
- Sequence headers each GOP (every frame)
- Progressive frames (since it's a progressive display device, not interlaced)
- End of sequence “Sequence Style”

All the encoders have demos and will batch encode (ExpertHD need a small script and a settings file to batch encode).

* TMPGEncoder includes filters that let you light optimize in the encoder.

Creating 3-D Objects

In general, any 3-D modeling program can be used to create objects. If the particular 3-D modeler does not export in DirectX .x format, a translation program will be needed to translate the object from the modeler's output format to the DirectX .x format. For example, you can use Newtek's Lightwave 3-D® modeler to generate 3-D objects in .lwo format, and then convert the object to .x format using Deep Exploration from Right Hemisphere.

The following list includes some general notes and tips for creating a custom 3-D object.

- With the control parameters (position, scaling and rotation) set at their default values, a rectangle measuring (13.0m, 9.65m, 0m) will just fill the screen.
- Objects are stored in Microsoft's DirectX .x format. .x files may be stored in either text form or binary form.

- An object can have one layer, one surface and one file texture.
- An object's UV (texture) coordinates should be in the range [0.0,1.0] to insure proper presentation. UV coordinates outside this range will wrap to this range but the results are not predictable.
- All polygons should be triangles. when creating objects, it can be easier to work with polygons that have more than three sides. However, an object should only contain triangles (three-sided polygons) when ultimately saved for use with the graphics engine.
- An object can contain multiple, disconnected subobjects as long as item 4 is followed. An example would be an object composed of an array of disconnected spheres or cubes.

Managing Custom Content

The Content Management Application running on your own computer as a client to DL.2 media servers via Ethernet manages any User Content you create. All Stock and User content can be viewed and refreshed but the CMA client gives you additional control over other aspects of your custom content.

Sections under *Managing User Content* on page 141 in *Chapter 14* describe the User content management functions including instructions on how to:

- Rename files and folders
- Delete files and folders
- Control DMX value assignment to files and folders
- Move files and folders between your local drive and a DL.2 fixture server
- Move files between networked DL.2 fixtures

Appendix D:

DL.2 Specifications

FIxture mechanical, electrical, optical and component cpecifications are listed.

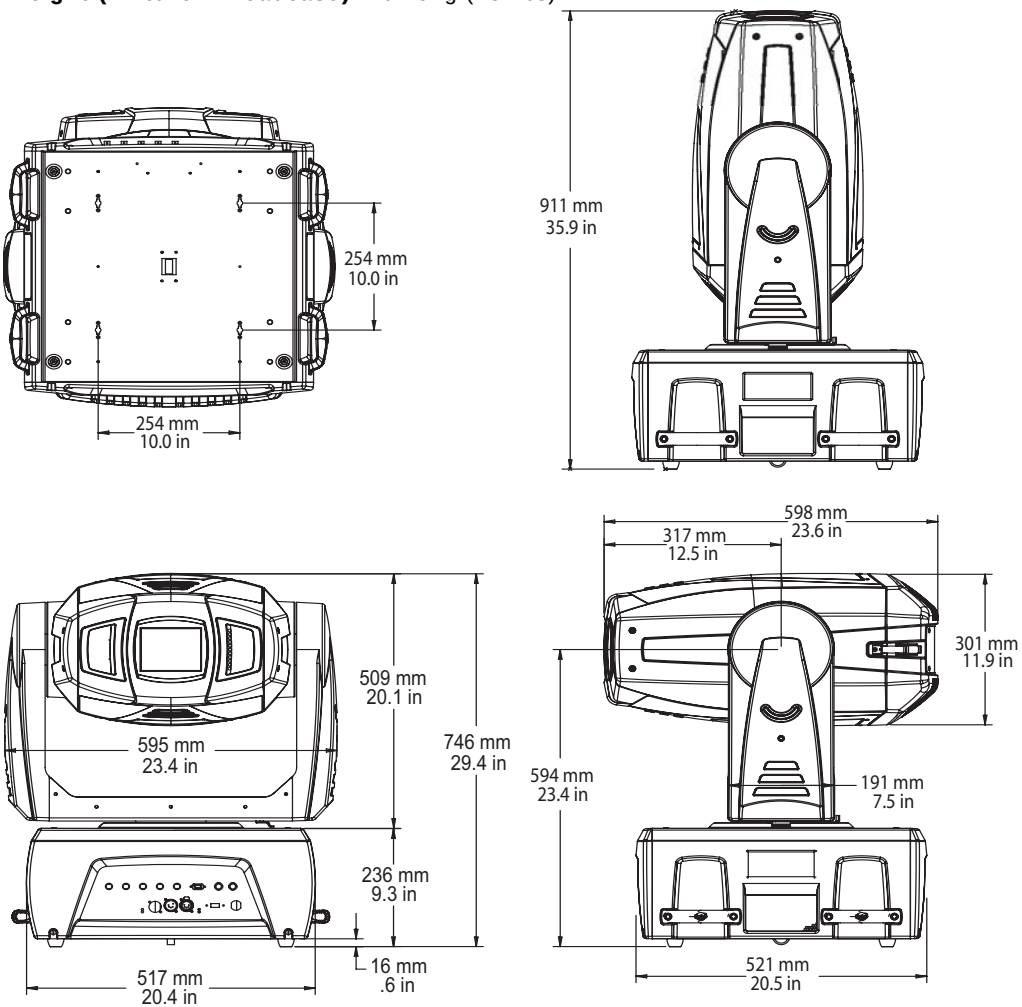
Mechanical

Fixture Dimensions: 595mm x 598mm x 911mm (23.4in x 23.6in x 35.9in)

Weight: 53.5 kg (118 lbs)

Road Case Dimensions: 699mm x 724 mm x 1080mm (27.5in x 28.5in x 42.5in)

Weight (Fixture + Roadcase): 107.5kg (237lbs)



Electrical Specifications

WARNING!
Class 1 equipment – This equipment must be earthed.

Input ratings: 100–120V 7.0A maximum 50/60Hz, 200–240V 3.5A 50/60Hz

Power factor: 0.94

Fuse: Power supply output fuse: 5A, 250V slow blow only.

Lamp: 300W NSH

Light Output: 5000 ANSI lumens

Rated Lamp Life: 1500 hours

Projector Specifications

Aspect ratio: 4:3 native

Brightness uniformity: 90%

Contrast ratio: 1200:1, full on/full off

Display technology: 1.3" LCD w/MLA, 3 panels

Panel resolution: 1024 x 768 dots

Zoom Lens Throw Ratio: 1.8 - 2.4:1

Camera Module Specification

Construction: Super HAD CCD sensor technology

Lens: 18x Optical Zoom

Horizontal view angle: 48° –2.8°

Auto focus Range: 29mm – 800mm

Picture Elements: 380K pixels {768 (H) x 582 (V)}

Minimum working distance: 29mm (WIDE end, 800mm (TELE end)

Environmental Specifications

Maximum ambient temperature (Ta): 35° C (95° F)

Cable and Connector Specifications

Video Connectors:

- RGBHV—BNC x 5
- VGA—DB15
- S-Video—mini-DIN

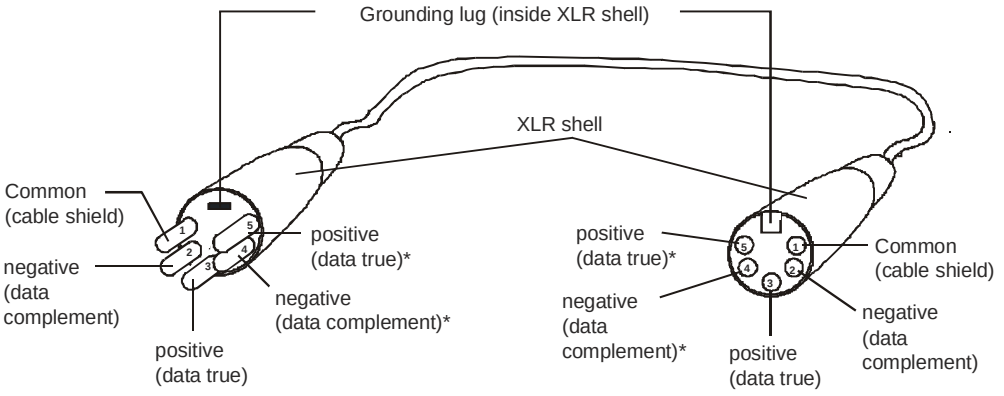
Peripheral/Network Connectors:

- 2 USB ports

DMX and RS-485 Projector Link

Cables: Belden 9841 or equivalent (meets specifications for EIA RS-485 applications) with the following characteristics:

- Two 4-conductor twisted pairs plus a shield
- Maximum capacitance between conductors: 30 pF/ft
- Maximum capacitance between conductor and shield: 55 pF/ft
- Maximum resistance: 20 Ohm/100 ft
- Nominal impedance: 100–140 Ohm

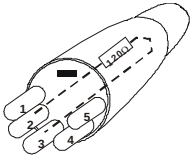


Male XLR Connector Female XLR Connector

**This data line is not used by the fixture, but allows data to pass through the fixture.*

Connectors: Two 5-pin male and female XLR connectors:

- Pin 1 Ground
- Pin 2 Data–
- Pin 3 Data+
- Pin 4 Secondary data–
- Pin 5 Secondary data+



Terminator: 5-pin male XLR connector with a 120 Ohm terminating resistor fitted between pins 2 and 3.

Appendix E:

Safety Information

Warning: For Continued Protection Against Fire

1. This equipment for connection to branch circuit having a maximum overload protection of 20 A.

Warning: For Continued Protection Against Electric Shock

1. If this equipment was received without a line cord plug, attach the appropriate line cord plug according to the following code:
   - brown–live
   - blue–neutral
   - green/yellow–earth
2. As the colours of the cores in the mains lead of this equipment may not correspond with the coloured markings identifying the terminals in your plug, proceed as follows:
   - the core which is coloured green and yellow must be connected to the terminal in the plug which is marked with the letter E or by the earth symbol ⏚, or coloured green or green and yellow.
   - the core which is coloured blue must be connected to the terminal which is marked with the letter N or coloured black.
   - the core which is coloured brown must be connected to the terminal which is marked with the letter L or coloured red.
3. Class I equipment. This equipment must be earthed.
4. Equipment suitable for dry locations only. Do not expose this equipment to rain or moisture.
5. Refer servicing to qualified personnel; no user serviceable parts inside.

Appendice E

Importantes Informations Sur La Sécurité

Mise En Garde: Pour Une Protection Permanente Contre Les Incendies

1. Cet appareil de connection au circuit comporte une protection contre les surcharges de 20 A.

Mise En Garde: Pour Une Protection Permanente Contre Les Chocs Électriques

1. Si cet équipement est livré sans prise de cable, veuillez connecter la prise de cable correcte selon le code suivant:
   - marron - phase
   - bleu - neutre
   - vert/jaune - terre
2. Débrancher le courant avant de changer les lampes ou d'effectuer des réparations.
3. Cet équipement doit être uniquement utilisé dans des endroits secs. Ne pas l'exposer à la pluie ou l'humidité.
4. À l'intérieur de l'équipement il n'y a pas de pièces remplaçables par l' utilisateur. Confiez l'entretien à un personnel qualifié.
5. Equipement de Classe I. Cet équipement doit être mis à la terre.

Anhang E

Wichtige Hinweise Für Ihre Sicherheit

Warnung: Zum Schutz Vor Brandgefahr

1. Dieses Gerät darf nur an eine Zweigleitung mit einem Überlastungsschutz von höchstens 20 A angeschlossen werden.

Warnung: Zum Schutz Gegen Gefährliche Körperströme

1. Wenn dieses Gerät ohne einen Netzkabelstecker erhalten wurde, ist der entsprechende Netzkabelstecker entsprechend dem folgenden Code anzubringen:
   - Braun - Unter Spannung stehend
   - Blau - Neutral
   - Grün/Gelb - Erde
2. Vor dem Austauschen von Lampen oder vor Wartungsarbeiten stets den Netzstecker ziehen.
3. Diese Geräte sind nur zum Einbau in trockenen Lagen bestimmt und müssen vor Regen und Feuchtigkeit geschützt werden.
4. Servicearbeiten sollten nur von Fachpersonal ausgeführt werden. Das Gerät enthält keine wartungsbedürftigen Teile.
5. Dieses Gerät gehört zur Klasse I. Dieses Gerät muß geerdet werden.

Apéndice E

Información Importante De Seguridad

Advertencia: Para Protección Continua Contra Incendios

1. Este equipo debe conectarse a un circuito que tenga una protección máxima contra una sobrecargas de 20 A.

Advertencia: Para La Protección Continua Contra Electrocuciones

1. Si se recibió este equipo sin el conector de alimentacion, monte usted el conector correcto según ia clave siguente:
   - moreno - vivo
   - azul - neutral
   - verde/amarillo - tierra
2. Desconecte el suministro de energía antes de cambiar lámparas o prestar servicio de reparación.
3. Este equipo esta disenado para usarce en lugares secos no lo exponga a la lluvia o humedad.
4. Derive el servicio de reparación de este equipo al personal calificado. El interior no contiene repuestos que puedan ser reparados por el usuario.
5. Equipo de Clase I. Este equipo debe conectarse a tierra.

Appendice E

Importanti Informazioni Di Sicurezza

Avvertenza: Per Prevenire Incendi

1. Questa apparecchiatura e' da collegarsi ad un circuito con una protezione da sovraccarico massima di 20 ampere.

Avvertenza: Per Prevenire Le Scosse Elettriche

1. Da non montare sopra una superficie infiammabile.
2. Mantenere l' apparecchio a un minimo di 1.0 metri (3.28 piedi) di distanza dai materiali combustibili.
3. Sostituire i fusibili usando soltanto quelli del tipo e della taratura adatta.
4. Mantenere una distanza minima di 1.0 metri (3.28 piedi) dagli oggetti accesi.
5. Questa apparecchiatura e' da collegarsi ad un circuito con una protezione da sovraccarico massima di 20 ampere.

Vigtig Sikkerhedsinformation

Advarsel: Beskyttelse mod elektrisk chock.

VIGTIGT! LEDEREN MED GUL/GROEN ISOLATION MAA KUN TILSLUTTES KLEMME MAERKET

ELLER .